

Workshop Manual

Audi A6 2011 ➤

Audi A7 Sportback 2011 ➤

TDI injection and glow plug system (4-cyl. 2.0 ltr. 4-valve common rail, generation II)

Engine ID	CGL C	CGL D	CMG B	CGL E					
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Edition 03.2014



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List of Workshop Manual Repair GroupsList of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Repair Group

23 - Mixture preparation - injection

28 - Glow plug system



Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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23 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

(ARL003767; Edition 03.2014)

⇒ [“1.1 Safety precautions when using testers and measuring instruments during a road test”, page 1](#)

⇒ [“1.2 Safety precautions for vehicles with start/stop system”, page 1](#)

⇒ [“1.3 Safety precautions when working on the fuel system”, page 2](#)

⇒ [“1.4 Safety precautions when working on the injection and glow plug system”, page 4](#)

⇒ [“1.5 Checking vacuum system”, page 5](#)

1.1 Safety precautions when using testers and measuring instruments during a road test

Note the following if testers and measuring instruments have to be used during a road test:



WARNING

Accidents can be caused if the driver is distracted by test equipment while road-testing, or if test equipment is not properly secured.

Persons sitting in the front passenger's seat could be injured if the airbag is triggered in an accident.

- *The use of test equipment while driving causes distraction.*
- *There is an increased risk of injury if test equipment is not secured.*
- ◆ *Test equipment must always be secured on the rear seat with a strap and operated from the rear seat by a second person.*

1.2 Safety precautions for vehicles with start/stop system



WARNING

Risk of injury due to automatic engine start on vehicles with start/stop system.

- ◆ *On vehicles with activated start/stop system (this is indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- ◆ *Therefore it is important to ensure that the start/stop system is deactivated when performing repairs (switch off ignition, if required switch on ignition again).*



1.3 Safety precautions when working on the fuel system

When working on the fuel system note the following warnings:



WARNING

The fuel can become extremely hot. This can cause injuries.

- ◆ *In extreme cases the fuel lines and the fuel can reach a temperature of 100 °C on vehicles with common rail engine, even after the engine is switched off. Allow the fuel to cool down before disconnecting the lines - danger of scalding.*

- ◆ *Wear protective gloves.*

- ◆ *Wear safety goggles.*

Risk of injury - fuel system operates under pressure.

- ◆ *If the battery is not disconnected, the fuse for the fuel pump control unit - J538- must be removed as a precautionary measure before opening the fuel system because the fuel pump will otherwise be activated by the contact switch on the driver's door.*

- ◆ *Wrap a clean cloth around the connection before opening the fuel system. Then release pressure by carefully loosening the connection.*

- ◆ *Wear protective gloves.*

- ◆ *Wear safety goggles.*



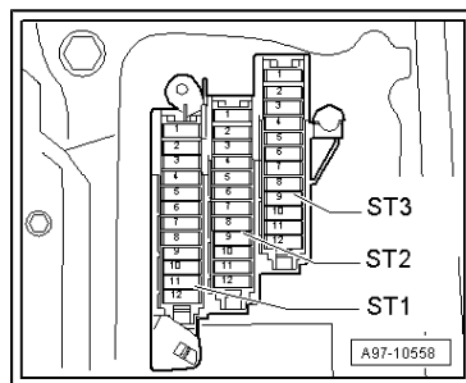
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If the battery is not disconnected, the fuse for the fuel pump control unit - J538- (located in the fuse carrier in the driver's side of the dash panel) must be removed as a precaution before opening the fuel system because the fuel pump could otherwise be activated by the contact switch on the driver's door.



Note

- ◆ The fuse is located in the fuse holder in the dash panel.
- ◆ Removing the fuse (located in fuse carrier in dash panel on driver's side) will interrupt the power supply from »terminal 30« for the fuel pump control unit - J538- . ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



Caution

The high-pressure pump has very close tolerances and must not be allowed to run without fuel. To prevent this and to enable the engine to start quickly after parts have been renewed, it is important to observe the following:

- ◆ If components of the fuel system between the fuel tank and the high-pressure pump are removed or renewed, the fuel system must be bled
 ⇒ ["2.3 Filling and bleeding fuel system", page 14](#) .
- ◆ If the high-pressure pump is removed or renewed, the first fuel filling operation must be performed before the engine is started for the first time ⇒ [page 28](#) .



Caution

To prevent irreparable damage to the electronic components when disconnecting the battery:

- ◆ Observe notes on procedure for disconnecting the battery.
- ◆ Always switch off the ignition before disconnecting the battery.

– Disconnect battery ⇒ Electrical system; Rep. gr. 27 .

General instructions:

- Clean tools and workbench etc. before working on the injection system.
- Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- When removing components, plug all open connections immediately with suitable clean sealing caps.
- Do not remove sealing caps from components until immediately prior to installation. Keep components that are to be re-used in new, sealable plastic bags.
- Before installing, check the injectors and their surroundings visually; they must be undamaged and clean. Make sure the injector bores in the cylinder head are clean. Wipe out if necessary using a clean cloth, taking care not to cause damage. Do not use sharp objects of any kind.



- If the high-pressure fuel lines are to be re-used, you must mark them before removal. High-pressure pipes must always be re-installed on the same cylinder.
- Take care not to damage the injectors when removing the old copper seals.
- Check all new O-rings for damage before installing. Lubricate O-rings with engine oil or assembly oil before installing.
- Position high-pressure pipes so they are free of stress. Tighten all unions lightly to start with before tightening to final torque.
- Never attempt to bend high-pressure fuel lines to shape.
- When working on any parts of the high-pressure fuel system, tools may only be used for loosening and tightening pipe unions. All other components must always be removed and installed by hand without using tools or other equipment.
- Press the fuel return hoses onto the injectors by hand from above so that they engage audibly on each injector (do not press in the release pins when doing this). Then press down the release pin after connecting the return line. Check that the fuel return hoses are seated securely and sealed properly by pulling them by hand from above.
- Do not dismantle individual common rail components. If there is a fault, the complete components must be renewed.
- When the engine is running, do not perform any repairs to the common rail system.
- Do not bleed the common rail system by unfastening high-pressure components after the engine has been started.
- All cable ties which are released or cut open when removing must be refitted in the same position when installing.
- When the fuel system is open: Do not work with compressed air if this can be avoided. Do not move the vehicle unless absolutely necessary.
- Also ensure that no diesel fuel comes into contact with the coolant hoses. Should this occur, the hoses must be cleaned immediately. Damaged hoses must be renewed.

1.4 Safety precautions when working on the injection and glow plug system

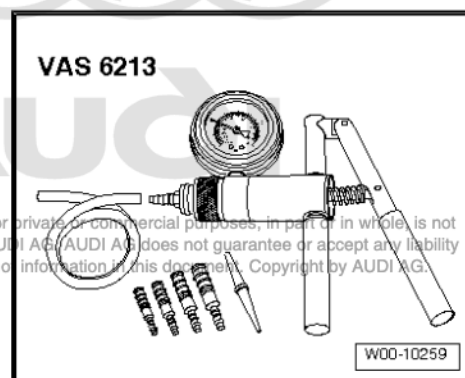
To prevent injuries to persons and/or damage to the fuel injection and glow plug system, note the following:

- ◆ The operation of piezo systems and control units requires very high voltages; certain components can cause injury if touched directly.
- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as piezo systems and xenon headlights.
- ◆ Always switch off the ignition before connecting or disconnecting tester cables or electrical wiring for the injection or glow plug system.
- ◆ Do not open any fuel line connections while the engine is running.
- ◆ Always switch off ignition before washing engine.
- ◆ Certain tests may lead to entries being stored in the event memory of the engine control unit. Therefore, interrogate and, if necessary, erase the event memory after all repairs and tests
⇒ Vehicle diagnostic tester.

1.5 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-



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Procedure

- Check all vacuum lines in the complete vacuum system for:
 - ◆ Cracks
 - ◆ Traces of animal bites
 - ◆ Kinked or crushed lines
 - ◆ Lines porous or leaking
- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If a fault is stored in the event memory, check all vacuum lines leading to the corresponding component, and also check the remaining vacuum lines leading to other components.
- If it is not possible to build up a vacuum with the hand vacuum pump - VAS 6213- or if the vacuum pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

2 Injection system

2.1 Overview of fitting locations - injection system

1 - Air mass meter - G70-

- ☐ Removing and installing
⇒ [page 19](#)

2 - Electrical connectors

- ☐ For Lambda probe - G39-
- ☐ For exhaust gas temperature sender 3 - G495-
- ☐ Fitting location
⇒ [page 10](#)

3 - Lambda probe - G39- with Lambda probe heater - Z19-

- ☐ Fitting location
⇒ [page 10](#)
- ☐ Exploded view
⇒ [page 59](#)

4 - Exhaust gas temperature sender 1 - G235-

- ☐ Fitting location
⇒ [page 12](#)

5 - Exhaust gas recirculation control motor - V338- with exhaust gas recirculation potentiometer - G212-

- ☐ Integrated into exhaust gas recirculation cooler
- ☐ Checking exhaust gas recirculation cooler change-over ⇒ Rep. gr. 26
- ☐ Removing and installing exhaust gas recirculation cooler ⇒ Rep. gr. 26

6 - Exhaust gas temperature sender 3 - G495-

- ☐ Fitting location ⇒ [page 10](#)
- ☐ Exploded view ⇒ [page 59](#)

7 - Radiator outlet coolant temperature sender - G83-

- ☐ Fitting location ⇒ [page 10](#)

8 - Pressure differential sender - G505-

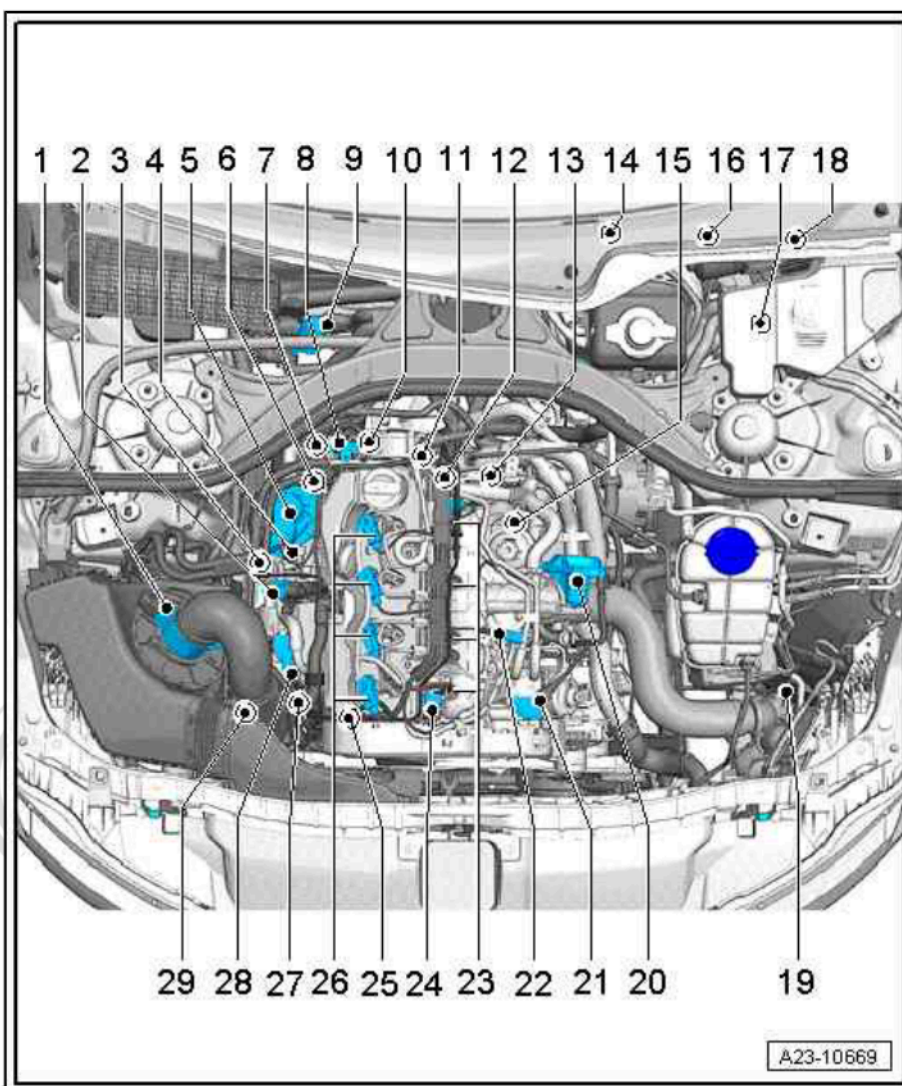
- ☐ Fitting location ⇒ [page 11](#)
- ☐ Exploded view ⇒ [page 59](#)

9 - Coolant circulation pump - V50-

- ☐ Vehicles with start/stop system only
- ☐ Removing and installing ⇒ Rep. gr. 19

10 - Exhaust gas temperature sender 4 - G648-

- ☐ Fitting location ⇒ [page 12](#)



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- ☐ Exploded view ➔ [page 59](#)
- 11 - Coolant temperature sender - G62-
 - ☐ Fitting location ➔ [page 10](#)
 - ☐ Removing and installing ➔ Rep. gr. 19
- 12 - Fuel pressure regulating valve - N276-
 - ☐ Fitting location ➔ [page 9](#)
 - ☐ Removing and installing ➔ [page 54](#)
- 13 - Engine speed sender - G28-
 - ☐ Fitting location ➔ [page 11](#)
 - ☐ Exploded view ➔ [page 67](#)
- 14 - Accelerator position sender - G79- and accelerator position sender 2 - G185-
 - ☐ Fitting location ➔ [page 8](#)
- 15 - Pump for exhaust gas recirculation cooler - V400-
 - ☐ Fitting location ➔ [page 9](#)
- 16 - Brake light switch - F- and brake pedal switch - F47-
 - ☐ Fitting location ➔ [page 9](#)
- 17 - Engine control unit - J623-
 - ☐ Fitting location ➔ [page 8](#)
 - ☐ Removing and installing ➔ [page 62](#)
- 18 - Clutch position sender - G476-
 - ☐ With clutch pedal switch for engine start - F194- and clutch pedal switch - F36-
 - ☐ Only on vehicles with manual gearbox
 - ☐ Fitting location ➔ [page 9](#)
- 19 - Charge pressure sender - G31- / intake air temperature sender - G42-
 - ☐ Fitting location ➔ [page 11](#)
 - ☐ Removing and installing ➔ Rep. gr. 21
- 20 - Throttle valve module - J338- with throttle valve potentiometer - G69-
 - ☐ Exploded view ➔ [page 20](#)
- 21 - Fuel metering valve - N290-
 - ☐ Fitting location ➔ [page 9](#)
 - ☐ Removing and installing ➔ [page 26](#)
- 22 - Fuel temperature sender - G81-
 - ☐ Fitting location ➔ [page 9](#)
- 23 - Glow plugs
 - ☐ Glow plug 1 - Q10-
 - ☐ Glow plug 2 - Q11-
 - ☐ Glow plug 3 - Q12-
 - ☐ Glow plug 4 - Q13-
 - ☐ Removing and installing ➔ [page 68](#)
- 24 - Fuel pressure sender - G247-
 - ☐ Fitting location ➔ [page 9](#)
 - ☐ Removing and installing ➔ [page 55](#)
- 25 - Hall sender - G40-
 - ☐ Fitting location ➔ [page 10](#)
 - ☐ Removing and installing ➔ [page 70](#)

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26 - Injectors

- ☐ Injector, cylinder 1 - N30-
- ☐ Injector, cylinder 2 - N31-
- ☐ Injector, cylinder 3 - N32-
- ☐ Injector, cylinder 4 - N33-
- ☐ Removing and installing ⇒ [page 42](#)

27 - Charge pressure control solenoid valve - N75-

- ☐ Fitting location ⇒ [page 12](#)

28 - Position sender for charge pressure positioner - G581-

- ☐ Fitting location ⇒ [page 11](#)

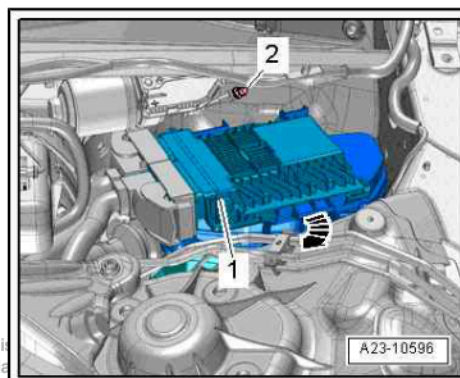
29 - Exhaust gas recirculation cooler change-over valve - N345-

- ☐ Electrical connector for exhaust gas temperature sender 1 - G235-
- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing exhaust gas recirculation cooler ⇒ Rep. gr. 26

Fitting location of engine control unit - J623-

- ◆ In electronics box in plenum chamber (left-side)

Removing and installing ⇒ [page 63](#)



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Fitting location: accelerator position sender - G79- and accelerator position sender 2 - G185-

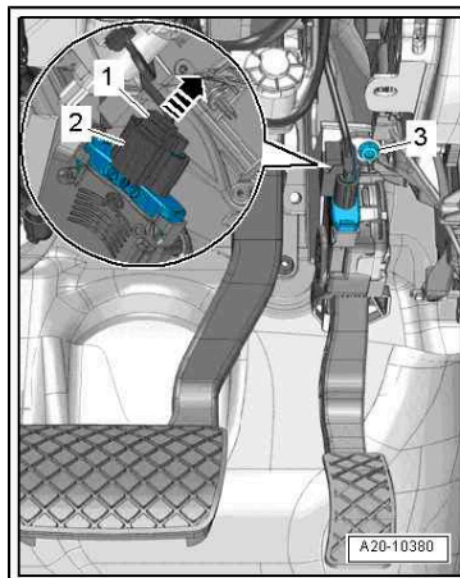
- ◆ In accelerator pedal module



Note

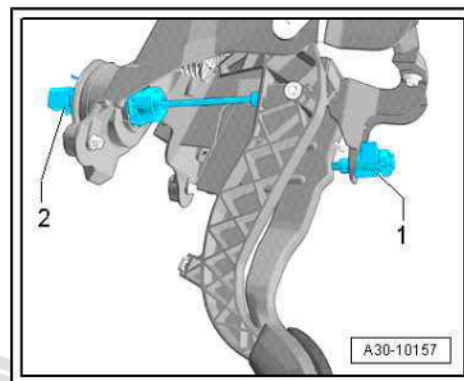
The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Removing and installing ⇒ Rep. gr. 20



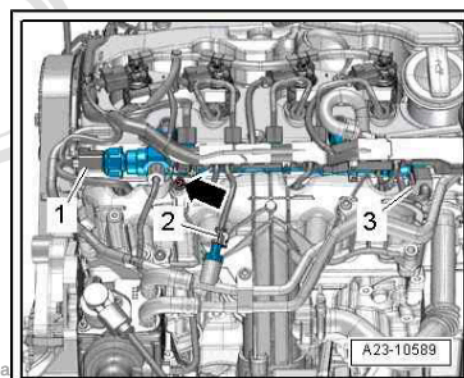
Fitting location of brake light switch - F- and brake pedal switch - F47- / clutch position sender - G476-

- 1 - Brake light switch - F- and brake pedal switch - F47-
- 2 - Clutch position sender - G476- with clutch pedal switch for engine start - F194- and clutch pedal switch - F36- (manual gearbox only)



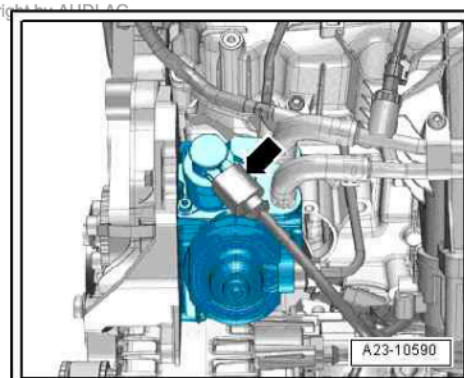
Fitting locations

- 1 - Fuel pressure sender - G247-
- 2 - Fuel temperature sender - G81-
- 3 - Fuel pressure regulating valve - N276-



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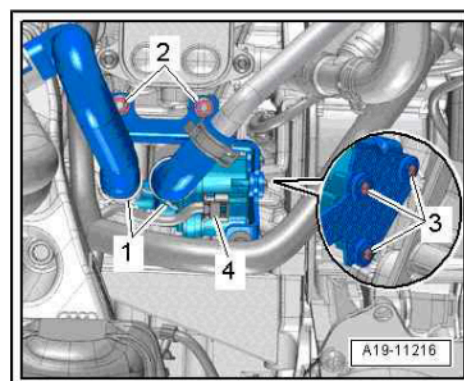
Fuel metering valve - N290- -arrow-



Fitting location of pump for exhaust gas recirculation cooler - V400-

4 - Electrical connector for pump for exhaust gas recirculation cooler - V400-

- ◆ At rear left of engine

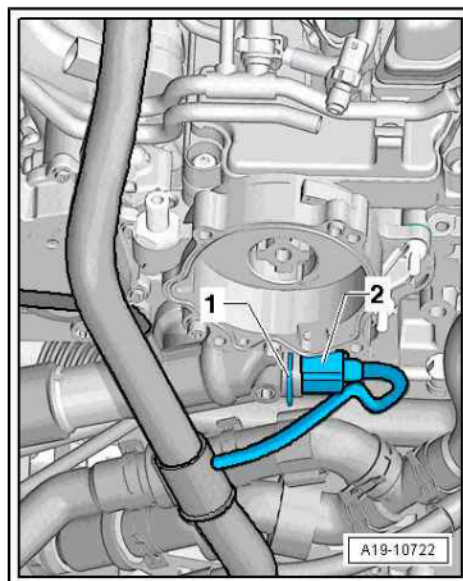


Fitting location of coolant temperature sender - G62-

2 - Electrical connector for coolant temperature sender - G62-

◆ At rear of engine

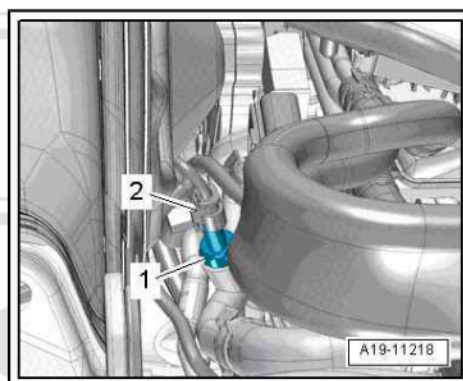
Removing and installing ⇒ Rep. gr. 19



Fitting location of radiator outlet coolant temperature sender - G83-

◆ -Item 1- in coolant pipe (rear)

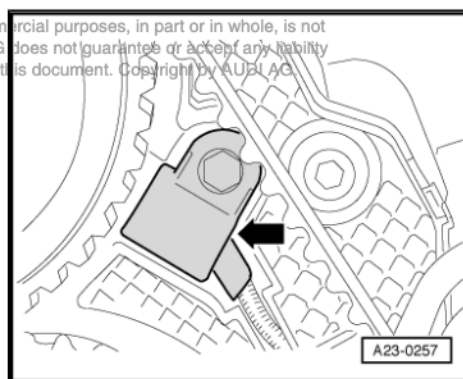
Removing and installing ⇒ Rep. gr. 19



Fitting location of Hall sender - G40-

◆ At front of engine next to camshaft sprocket - arrow

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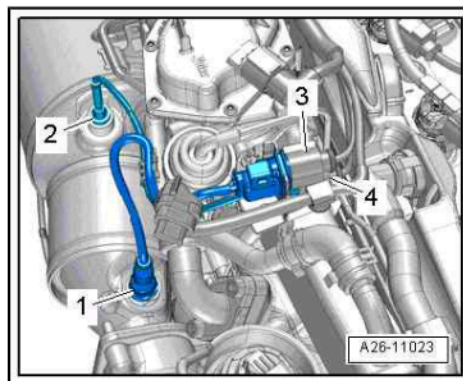
Fitting locations

1 - Lambda probe - G39-

2 - Exhaust gas temperature sender 3 - G495-

3 - Electrical connector for Lambda probe - G39-

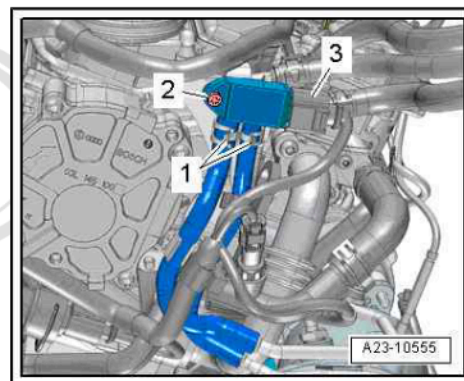
4 - Electrical connector for exhaust gas temperature sender 3 - G495-



Fitting location of pressure differential sender - G505-

3 - Electrical connector for pressure differential sender - G505-

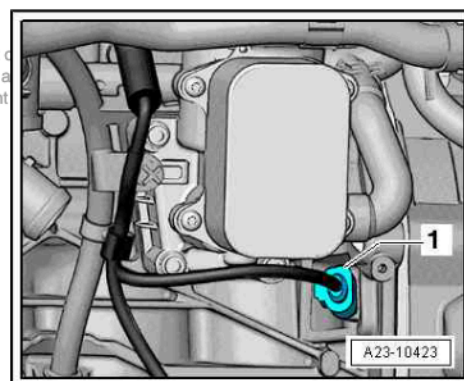
◆ At rear of engine



Fitting location of engine speed sender - G28-

1 - Electrical connector for engine speed sender - G28-

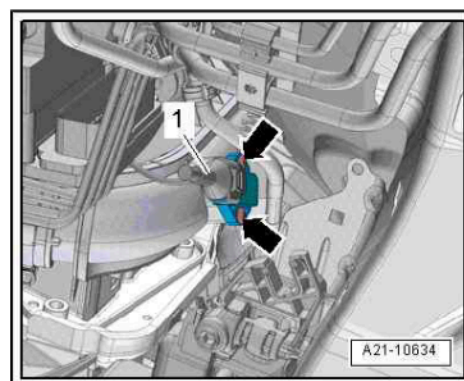
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Fitting location of charge pressure sender - G31- with intake air temperature sender - G42-

1 - Electrical connector for charge pressure sender - G31- with intake air temperature sender - G42-

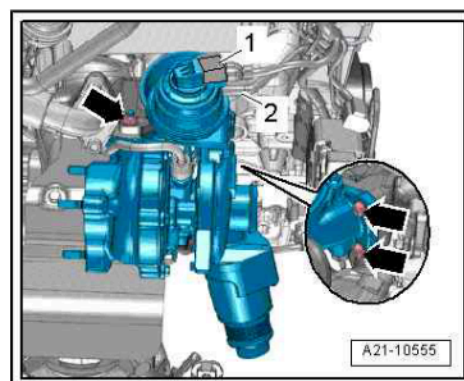
◆ In engine compartment (front left)



Fitting location of position sender for charge pressure positioner - G581-

1 - Electrical connector for position sender for charge pressure positioner - G581-

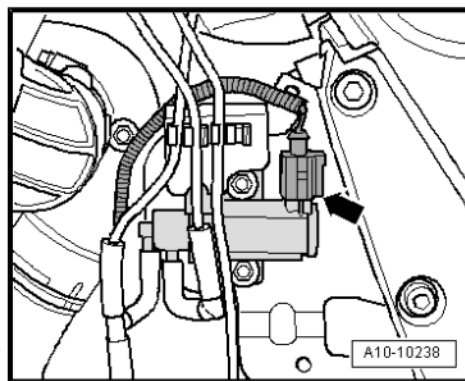
◆ On turbocharger on right side of engine





Fitting location of charge pressure control solenoid valve - N75-

◆ At front right of engine -arrow-

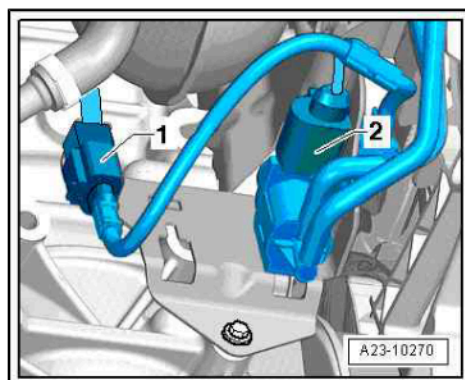


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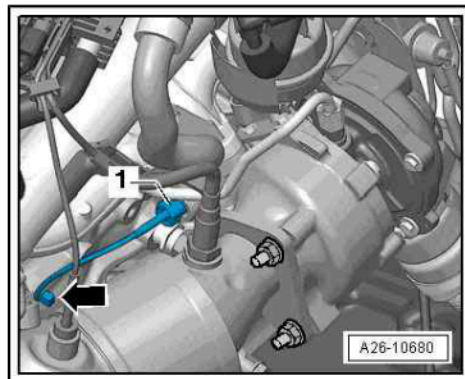
Electrical connectors

1 - Exhaust gas temperature sender 1 - G235-

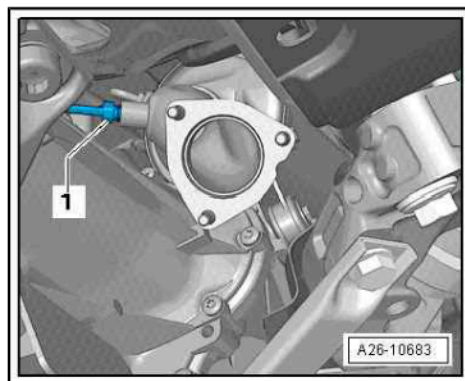
2 - Exhaust gas recirculation cooler change-over valve - N345-



Exhaust gas temperature sender 1 - G235- -1-



Exhaust gas temperature sender 4 - G648- -1-



2.2 Overview - fuel system



Caution

The high-pressure pump has very close tolerances and must not be allowed to run without fuel. To prevent this and to enable the engine to start quickly after parts have been renewed, it is important to observe the following:

- ◆ *If components of the fuel system between the fuel tank and the high-pressure pump are removed or renewed, the fuel system must be bled
⇒ ["2.3 Filling and bleeding fuel system", page 14](#).*
- ◆ *If the high-pressure pump is removed or renewed, the first fuel filling operation must be performed before the engine is started for the first time ⇒ [page 28](#).*



Note

The high-pressure pump will be damaged if the first fuel filling operation is not performed.

1 - Fuel tank

- ❑ With fuel system pressurisation pump - G6-

2 - Fuel filter

- ❑ Exploded view ⇒ Rep. gr. 20

3 - Not fitted

4 - Filter strainer

5 - Fuel temperature sender - G81-

6 - High-pressure pump

- ❑ After renewing high-pressure pump or fuel pressure regulating valve - N276-, learnt values must be re-adapted using ⇒ Vehicle diagnostic tester
- ❑ Exploded view
⇒ [page 25](#)

7 - Fuel metering valve - N290-

- ❑ Do not unscrew

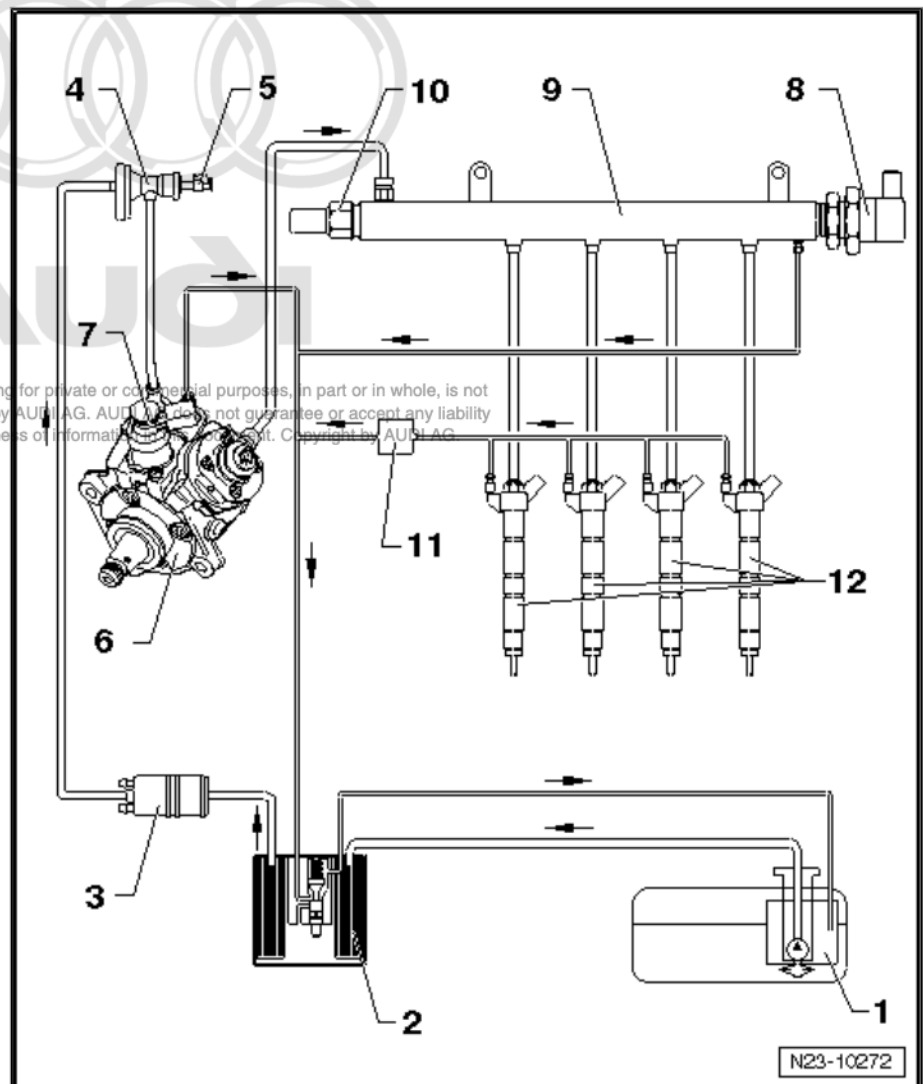
8 - Fuel pressure regulating valve - N276-

- ❑ Exploded view
⇒ [page 31](#)

9 - Fuel rail

10 - Fuel pressure sender - G247-

- ❑ Exploded view
⇒ [page 31](#)





11 - Restrictor

12 - Injector

❑ Exploded view ⇒ [page 31](#)



2.3 Filling and bleeding fuel system

Special tools and workshop equipment required

♦ Vehicle diagnostic tester



Caution

- ♦ *If components of the fuel system between the fuel tank and the high-pressure pump are removed or renewed, the fuel system must be bled.*

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Proceed as follows to fill fuel system with fuel:

- Connect a ⇒ Vehicle diagnostic tester.
- Switch on ignition.
- Select “Engine electronics” in vehicle self-diagnosis.
- Then select “Basic setting”.
- Select “Checking fuel system pressurisation pump” from the list.
- Press “Start” button.
- The fuel pump starts running.
- The fuel pump must run for approx. 2 minutes to ensure that the fuel system is filled sufficiently with fuel.
- Start engine after filling fuel system.
- Run engine at moderate speed for several minutes and then switch off.
- Check fuel system for leaks.
- Erase any entries in event memory resulting from testing ⇒ Vehicle diagnostic tester, Guided Functions, then 01 - Interrogate/erase event memory.
- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

- Interrogate event memory again.

3 Air cleaner

⇒ ["3.1 Exploded view - air cleaner", page 15](#)

⇒ ["3.2 Removing and installing engine cover panel", page 16](#)

⇒ ["3.3 Removing and installing air filter element", page 16](#)

⇒ ["3.4 Removing and installing air cleaner housing", page 18](#)

⇒ ["3.5 Removing and installing air mass meter G70 ", page 19](#)

3.1 Exploded view - air cleaner

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1 - Air duct

- ☐ Clean out salt deposits, dirt and leaves, etc.

2 - Sealing element

3 - Retainer

- ☐ For air cleaner housing

4 - Air cleaner housing

- ☐ Clean out salt deposits, dirt and leaves, etc.
- ☐ Removing and installing
 ⇒ ["3.4 Removing and installing air cleaner housing", page 18](#)

5 - Air filter element

- ☐ Use genuine air filter element ⇒ Electronic parts catalogue
- ☐ Change intervals ⇒ Maintenance tables
- ☐ Removing and installing
 ⇒ ["3.3 Removing and installing air filter element", page 16](#)

6 - Cover

- ☐ For air cleaner housing
- ☐ Clean out salt deposits and dirt

7 - Housing for air mass meter - G70-

8 - Bolt

9 - Air mass meter - G70-

10 - Air duct

- ☐ Clean out salt deposits, dirt and leaves, etc.

11 - Air pipe

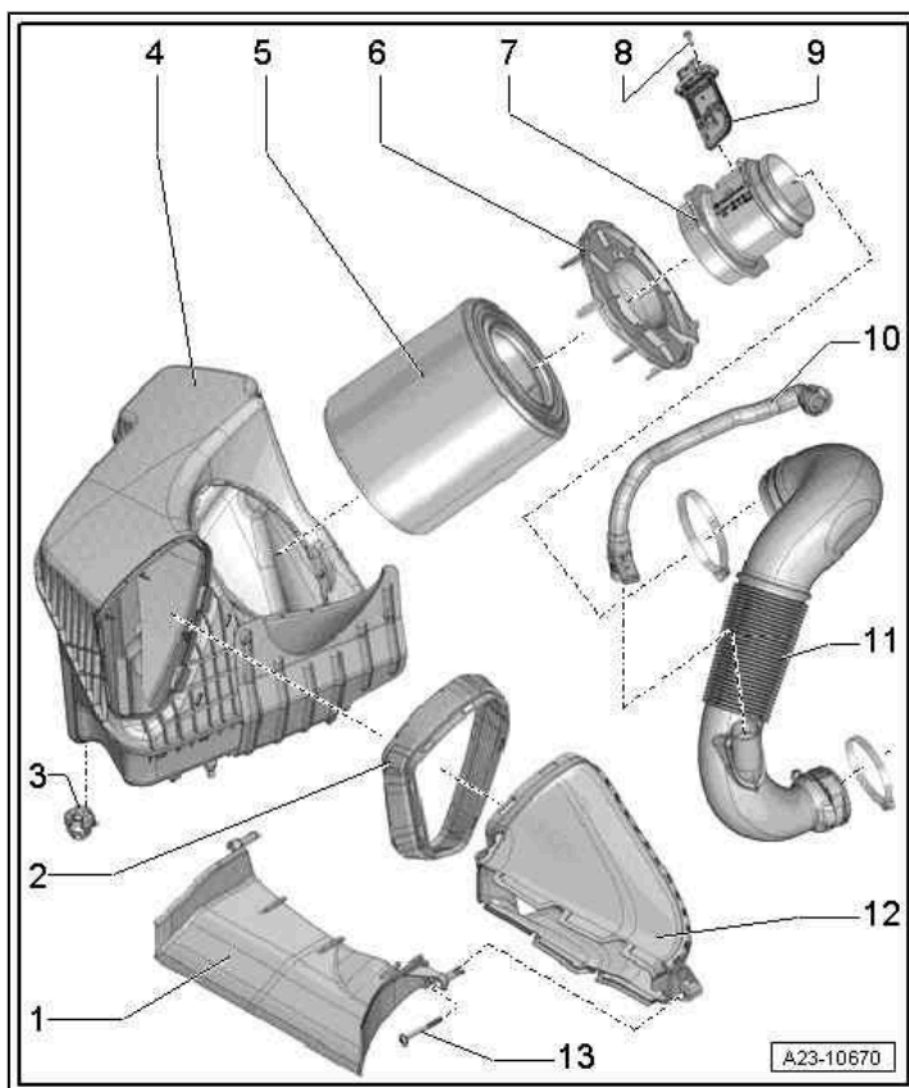
- ☐ Tightening torque for screw-type clips ⇒ [page 16](#)

12 - Air duct

- ☐ Clean out salt deposits, dirt and leaves, etc.

13 - Bolt

- ☐ 1.5 Nm

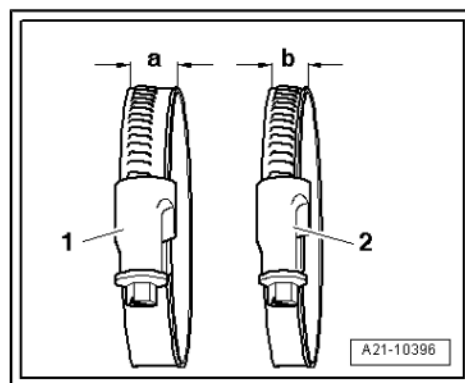


Installing air pipes and hoses with screw-type clips



Note

- ◆ *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of screw-type clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*



Tightening torque for

- 1 - Screw-type clip -a- = 13 mm wide: 5.5 Nm
- 2 - Screw-type clip -b- = 9 mm wide: 3.4 Nm

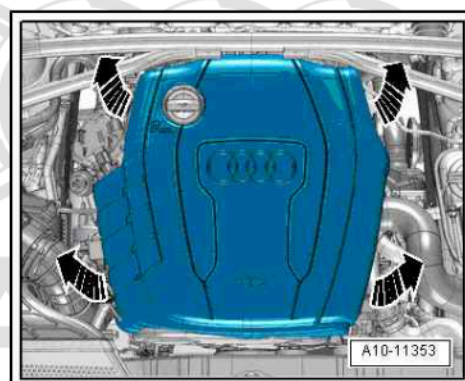
3.2 Removing and installing engine cover panel

Removing

- Carefully pull engine cover panel off retaining pins one after the other -arrows-. Do not jerk engine cover panel away, and do not try to pull on one side only.

Installing

- To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.
- Observe oil filler neck when positioning engine cover panel.
- Press engine cover panel with both hands into the rubber grommets at the rear and then into the grommets at the front.

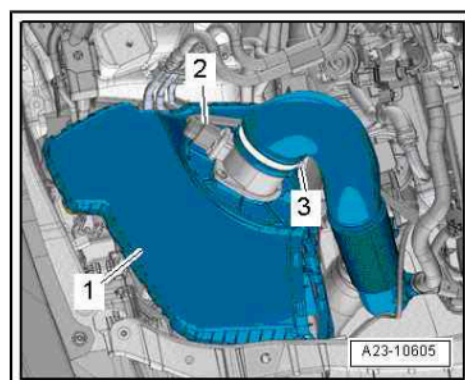


3.3 Removing and installing air filter element

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Removing

- Unplug electrical connector -2- at air mass meter - G70- .
- Open hose clip -3- at air hose and disconnect air hose at air mass meter - G70- .




- Release catch -1-, turn cover for air cleaner housing in anti-clockwise direction -arrow A- and detach.
- Take out air filter element.

Installing

Tightening torques

- ◆ ⇒ **"3.1 Exploded view - air cleaner", page 15**

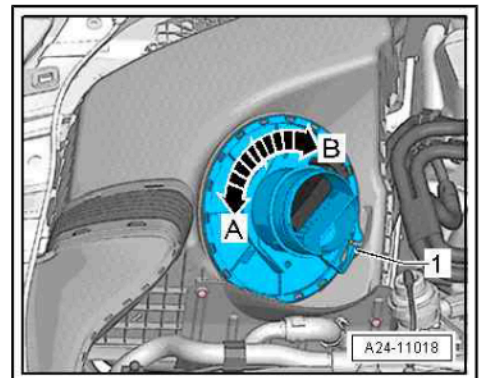
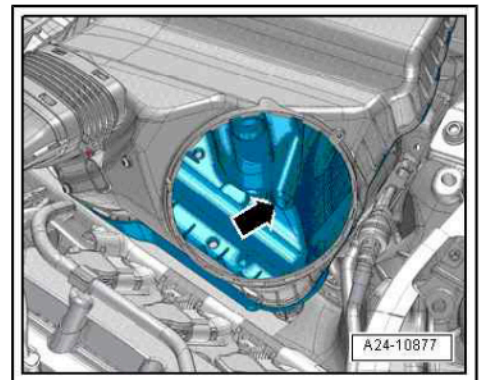
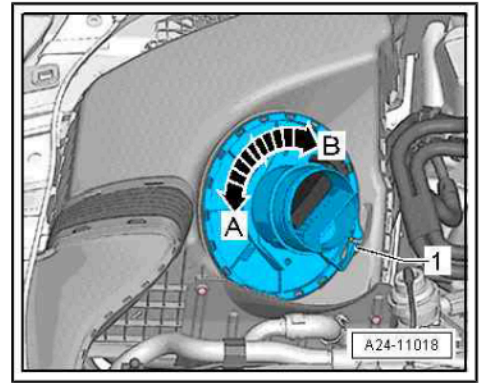
To ensure that the air mass meter - G70- functions properly, it is important to observe the following notes and instructions.

 **Note**
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- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter - G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element.*
- ◆ *The air cleaner housing MUST be clean.*
- ◆ *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- ◆ *Use a silicone-free lubricant when installing the air hoses.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To prevent malfunctions, cover critical parts of the engine air intake (air mass meter, air pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ *Observe environmental requirements for disposal.*

- Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections) using a vacuum cleaner.
- Blow out water drain -arrow- with compressed air.
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
- When installing air filter element, check that it is properly centred in retainer in air cleaner housing.
- Carefully fit cover on air cleaner housing without using force.
- Turn cover in clockwise direction -arrow B- until catch -1- engages.
- Ensure secure fit of intake hose at air mass meter - G70- .

The remaining installation steps are carried out in the reverse sequence.



3.4 Removing and installing air cleaner housing

Removing

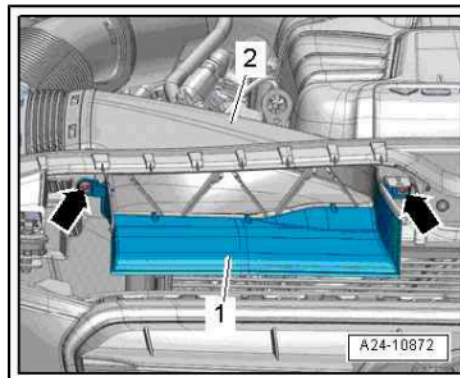
- Remove lock carrier cover ⇒ Rep. gr. 63 .
- Remove bolts -arrows- and detach air duct -2-.



Note

Disregard -item 1-

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- Unplug electrical connector -2- at air mass meter - G70- .
- Open hose clip -3- at air hose and disconnect air hose at air mass meter - G70- .
- Lift out air cleaner housing -1-.

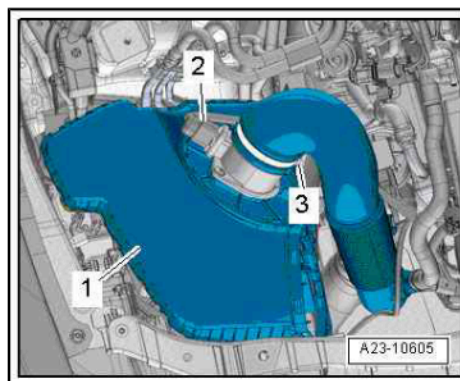
Installing

To ensure the proper function of the air mass meter - G70- it is important to observe the following instructions.



Note

- ♦ *The air cleaner housing MUST be clean.*
- ♦ *To prevent malfunctions, cover critical parts of the engine air intake (air mass meter, air pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ♦ *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- ♦ *Use a silicone-free lubricant when installing the air hoses.*
- ♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- Check water drain hose in air cleaner (bottom section) for dirt and other obstructions (clean if necessary).
- Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.
- Check for salt residue, dirt and leaves in air hose (engine intake side).
- Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
- Re-install air cleaner housing.
- Ensure secure fit of air hose at air mass meter - G70- .



The remaining installation steps are carried out in the reverse sequence.

- Install lock carrier cover ⇒ Rep. gr. 63 .

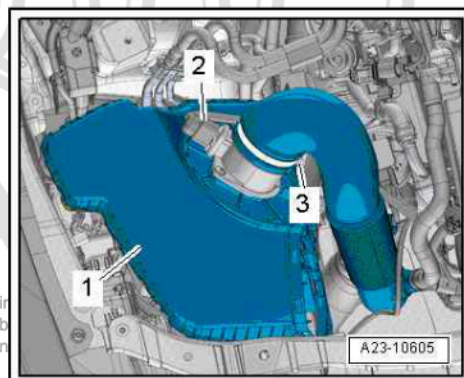
3.5 Removing and installing air mass meter - G70-

Removing

- Unplug electrical connector -2- at air mass meter - G70- .
- Open hose clip -3- at air hose and disconnect air hose at air mass meter - G70- .
- Unscrew both bolts from air mass meter - G70- .
- Then carefully pull air mass meter - G70- out of guide on air cleaner housing.

Installing

To ensure that the air mass meter -G70- functions properly, it is important to observe the following notes and instructions:



Note

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Use a silicone-free lubricant when installing the air hoses.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Check for dirt in air duct leading to air filter element. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing air cleaner ⇒ [page 18](#) .

The remaining installation steps are carried out in the reverse sequence.

4 Intake manifold

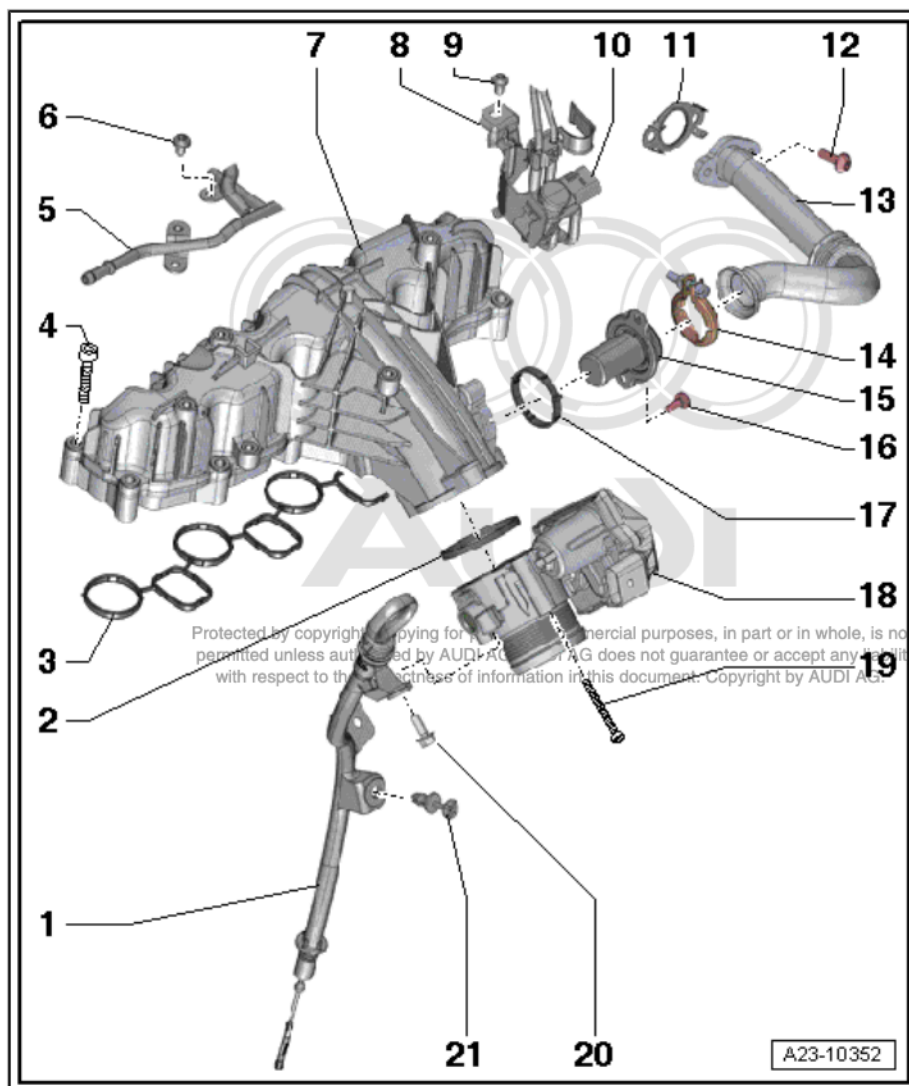
⇒ "4.1 Exploded view - intake manifold", page 20

⇒ "4.2 Removing and installing throttle valve module J338", page 21

⇒ "4.3 Removing and installing intake manifold", page 21

4.1 Exploded view - intake manifold

- 1 - Guide tube
☐ For oil dipstick
- 2 - Seal
☐ Renew
- 3 - Gasket
☐ Renew
- 4 - Bolt
☐ 8 Nm
- 5 - Fuel return line
☐ Version fitted in vehicle may differ from illustration
- 6 - Bolt
☐ 9 Nm
- 7 - Intake manifold
☐ Removing and installing
⇒ [page 21](#)
- 8 - Not fitted
- 9 - Not fitted
- 10 - Not fitted
- 11 - Gasket
☐ Renew
- 12 - Bolt
☐ 9 Nm
- 13 - Connecting pipe
☐ To exhaust gas recirculation cooler
- 14 - Clamp
☐ Renew
☐ 5 Nm
- 15 - Connection
☐ For exhaust gas recirculation
- 16 - Bolt
☐ 9 Nm
- 17 - Seal
☐ Renew
- 18 - Throttle valve module - J338-
☐ With throttle valve potentiometer - G69-



- ❑ Removing and installing ⇒ [page 21](#)

19 - Bolt

- ❑ 8 Nm

20 - Bolt

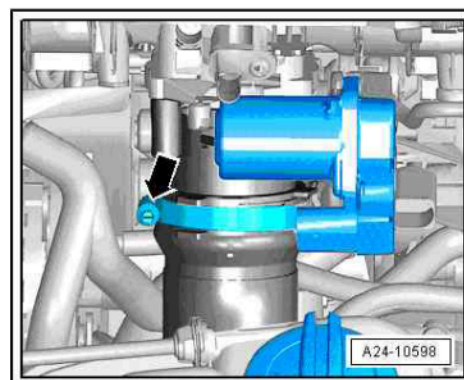
- ❑ 9 Nm

21 - Clip

4.2 Removing and installing throttle valve module - J338-

Removing

- Pull off engine cover panel ⇒ [page 16](#) .
- Release hose clip -arrow- and detach air hose downwards.



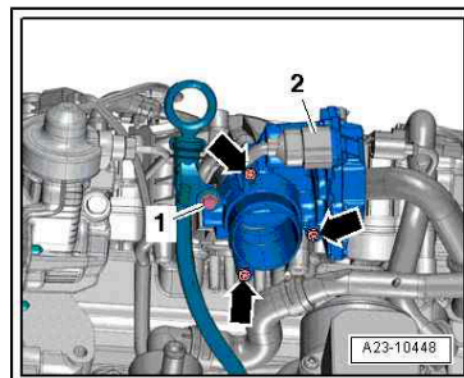
- Unplug electrical connector -2-.
- Remove bolt -1- for dipstick guide tube.
- Remove bolts -arrows- and detach throttle valve module - J338- .

Installing

Installation is carried out in the reverse order; note the following:

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- ◆ ⇒ ["4.1 Exploded view - intake manifold", page 20](#)



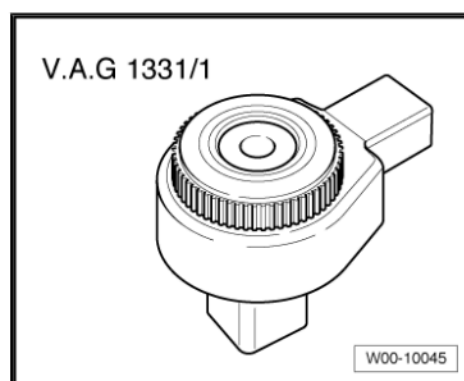
Note

Fit new O-ring.

4.3 Removing and installing intake manifold

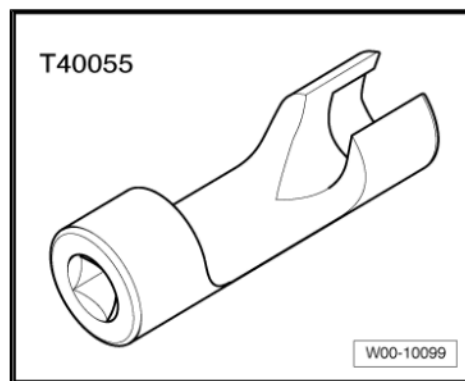
Special tools and workshop equipment required

- ◆ Ratchet - V.A.G 1331/1-



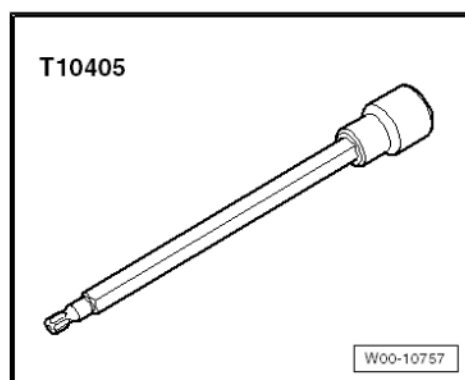


◆ Socket - T40055-



◆ Socket Torx T30 - T10405-

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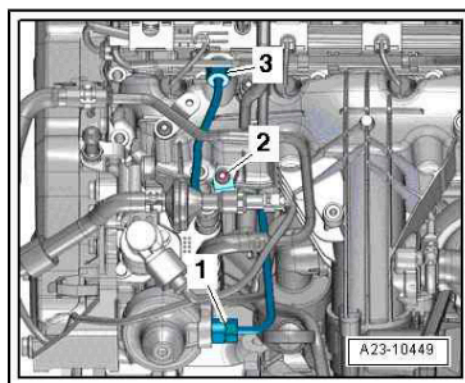
Removing



Caution

- ◆ *Observe ⇒ [page 2](#) .*
- ◆ *Risk of malfunctions caused by dirt.*

- Pull off engine cover panel ⇒ [page 16](#) .
- Unplug electrical connectors on glow plugs ⇒ [page 68](#) .
- Remove bolt -2- and union nuts -1 and 3- and detach high-pressure pipe.

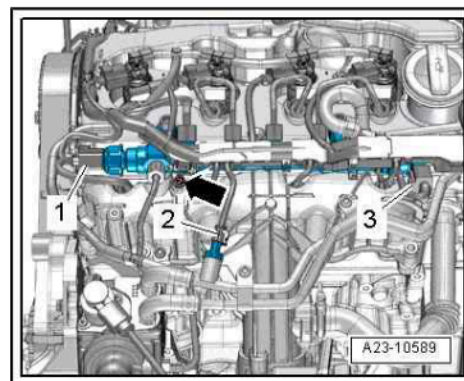


- Unplug electrical connectors -2 and 3-.
- Remove bolt -arrow- and push wiring retainer to the side.



Note

Disregard -item 1-.

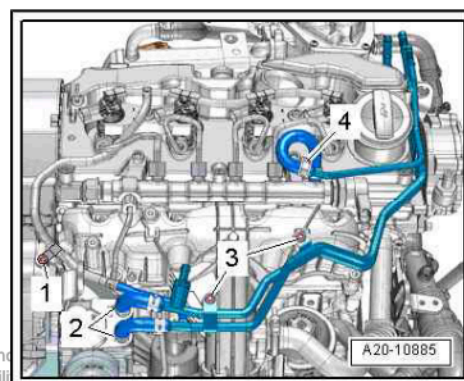


- Remove bolts -1 and 3-.
- Release hose clips -2 and 4- and detach fuel hoses.
- Pull fuel lines upwards off cylinder head cover and press clear to one side.



Note

Do not bend fuel lines.



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Caution

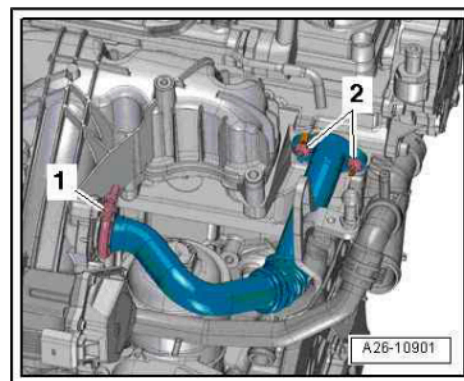
- ◆ *Observe rules for cleanliness when working on the injection system.*
- ◆ *Plug open connections with suitable sealing caps immediately.*

- Open clamp -1- and detach.

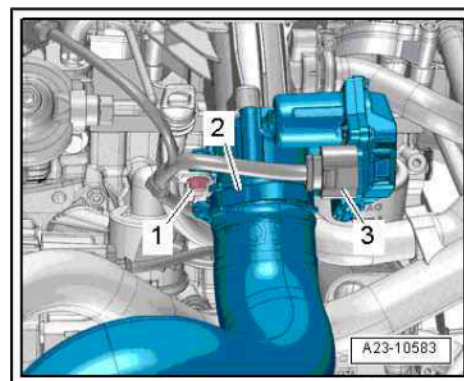


Note

Disregard -item 2-.



- Release hose clip -2- and detach air hose.
- Remove bolt -1- for dipstick guide tube.
- Unplug electrical connector -3- at throttle valve module - J338- .





- Unscrew intake manifold bolts -arrows- in diagonal sequence starting from outside and working inwards using socket Torx T30 - T10405- .

Installing

Installation is carried out in the reverse order; note the following:

Tightening torques

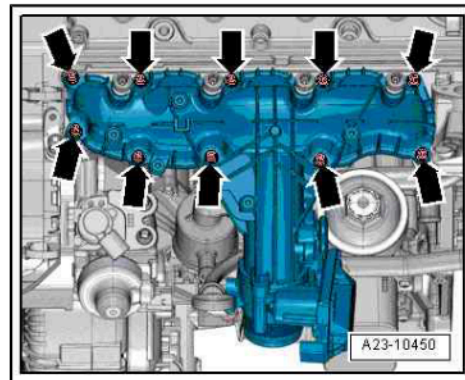
- ♦ ⇒ [“4.1 Exploded view - intake manifold”, page 20](#)



Note

Renew seals and/or gaskets.

- Tighten intake manifold bolts in diagonal sequence, working from inside to outside.
- Install high-pressure pipe ⇒ [page 50](#) .



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5 High-pressure pump

⇒ ["5.1 Exploded view - high-pressure pump", page 25](#)

⇒ ["5.2 Removing and installing high-pressure pump", page 26](#)

⇒ ["5.4 Checking fuel system for leaks", page 29](#)

⇒ ["5.3 Performing first fuel filling after installing high-pressure pump", page 28](#)

5.1 Exploded view - high-pressure pump

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1 - Bracket for ancillaries

- ☐ Removing and installing
⇒ Rep. gr. 13

2 - Bolt

- ☐ 2x
- ☐ Renew
- ☐ 20 Nm + 180°

3 - Hub

- ☐ Use counterhold tool - T10051- when loosening and tightening
- ☐ To remove, use puller - T40064-

4 - High-pressure pump sprocket

5 - Bolt

- ☐ 3x
- ☐ Renew
- ☐ 20 Nm

6 - Nut

- ☐ 95 Nm

7 - Bolt

- ☐ Renew
- ☐ 20 Nm + 45°

8 - High-pressure pump

- ☐ With fuel metering valve - N290- (do not open)
- ☐ After renewing, first fuel filling operation **MUST** be performed (it is important not to allow pump to run while it is still empty) ⇒ [page 28](#)

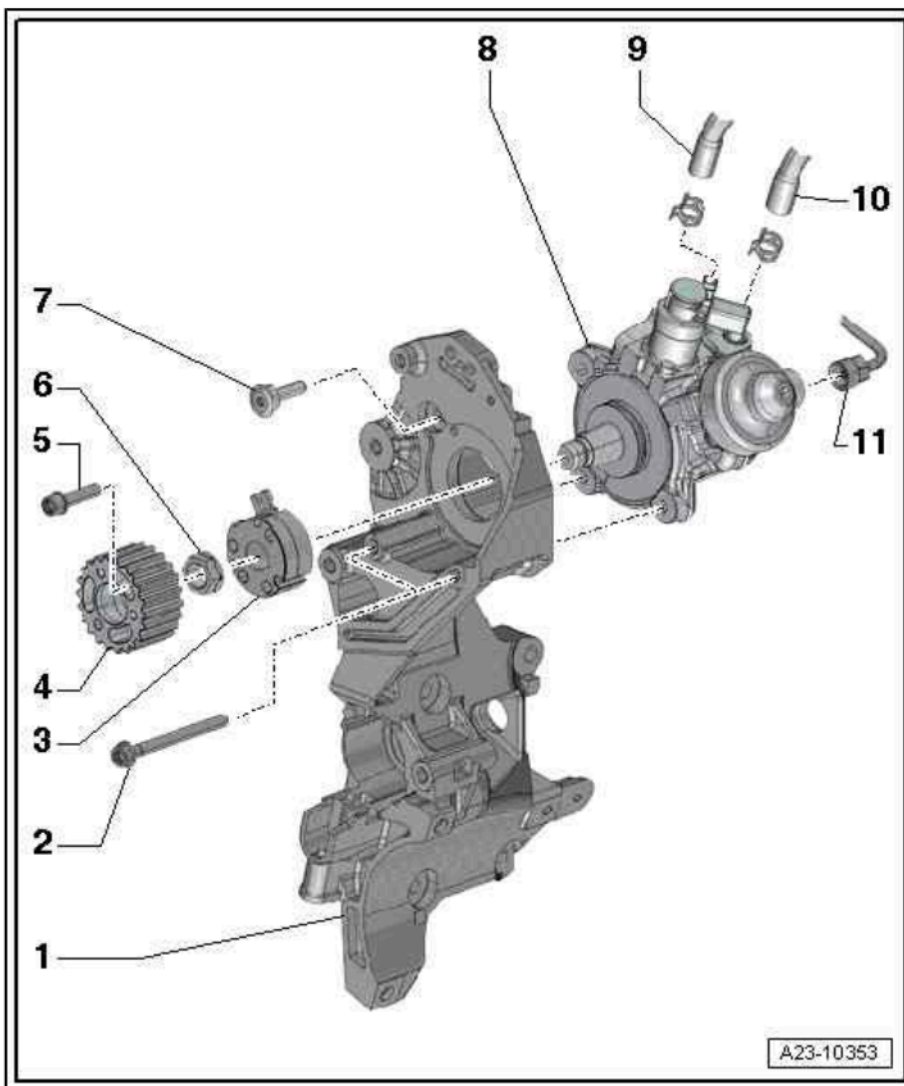
- ☐ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see "Guided Functions" in ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 26](#)

9 - Fuel supply hose

10 - Fuel return hose

11 - High-pressure pipe

- ☐ Between high-pressure pump and fuel rail





Note

- ◆ *The high-pressure pipes can be re-used after performing the following checks:*
- ◆ *Check taper seat for deformation and cracks.*
- ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- ◆ *Corroded pipes must not be used again.*

- ☐ Install free of stress
- ☐ Lubricate threads of union nuts with clean engine oil
- ☐ 25 Nm

5.2 Removing and installing high-pressure pump



Caution

Risk of malfunctions caused by dirt.

- ◆ *Observe ⇒ [page 2](#).*

The high-pressure fuel pump has very close tolerances and must not be allowed to run without fuel. To prevent this and to enable the engine to start quickly after parts have been renewed, it is important to observe the following.

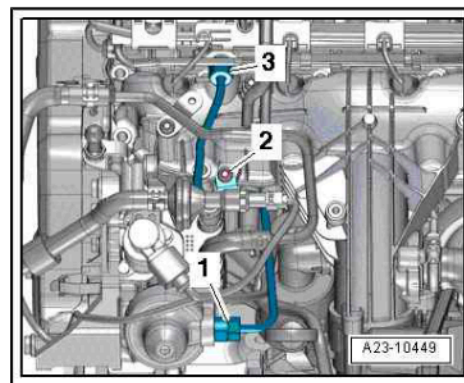
- ◆ *If components of the fuel system between the fuel tank and the high-pressure pump are removed or renewed, the first fuel filling operation must be performed.*
- ◆ *If a fuel pump, fuel line (between fuel tank and high-pressure pump) or fuel filter is removed or renewed, the fuel system must be bled before the engine is started for the first time.*
- ◆ *If the high-pressure pump is removed or renewed, the fuel system must be bled before the engine is started for the first time.*

Procedure for first fuel filling ⇒ [page 28](#)

Removing

- Remove toothed belt from camshaft and high-pressure pump
⇒ Rep. gr. 15 .

- Remove bolt -2- and union nuts -1 and 3- and detach high-pressure pipe.

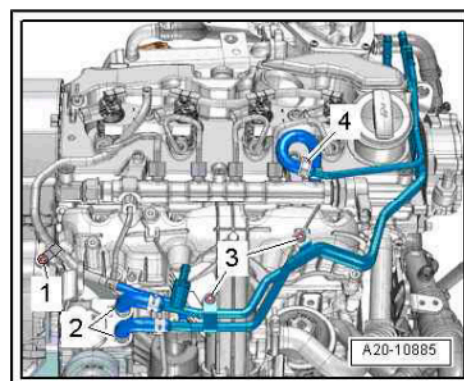


- Remove bolts -1 and 3-.
- Release hose clips -2- and detach fuel hoses.
- Pull fuel lines upwards off cylinder head cover and press clear to one side.

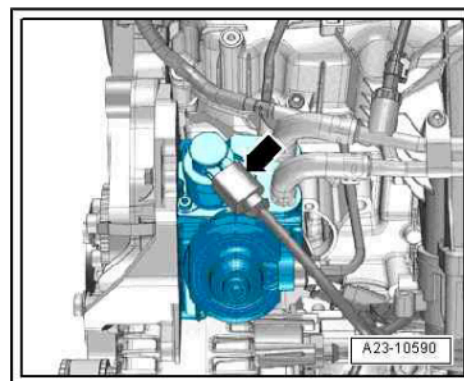


Note

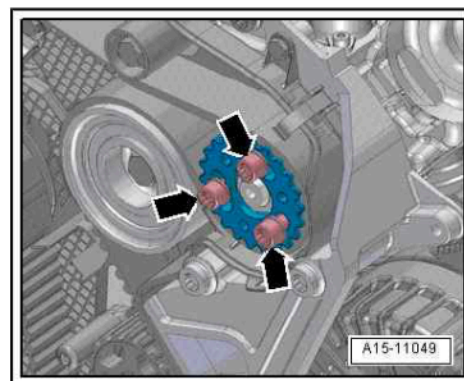
Disregard -item 4-.



- Unplug electrical connector -arrow- at fuel metering valve - N290- .

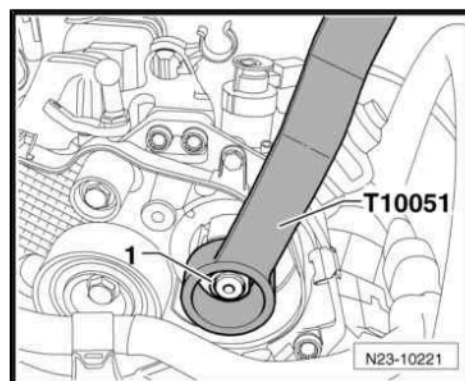


- Using bit XZN 10, T10385, unscrew bolts -arrows- for high-pressure pump sprocket.

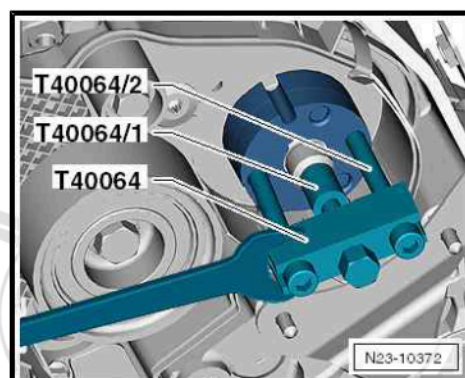


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- Counterhold using counterhold tool - T10051- and remove nut -1- at hub of high-pressure pump.



- Apply puller - T40064- with thrust piece - T40064/1- and pin - T40064/2- as shown in illustration and pull hub off high-pressure pump. If necessary, counterhold using an open-end spanner (24 mm).



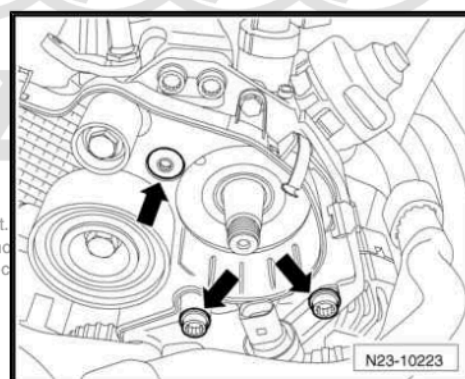
- Unscrew securing bolts -arrows- for high-pressure pump.
- Carefully take out high-pressure pump.

Installing

Installation is carried out in the reverse order; note the following:

Tightening torques

- ♦ ➔ **"5.1 Exploded view - high-pressure pump", page 25**
- Install toothed belt for high-pressure pump ➔ Rep. gr. 15 .
- Install high-pressure pipe ➔ **page 50** .



Caution

- ♦ *The high-pressure pump must first be filled with fuel before the engine is started. The high-pressure pump must not be allowed to run while still empty. First fuel filling ➔ **page 28** .*
- ♦ *Running when dry causes irreparable damage to high-pressure pump.*

5.3 Performing first fuel filling after installing high-pressure pump

Special tools and workshop equipment required

- ♦ Vehicle diagnostic tester



Caution

Running when dry causes irreparable damage to high-pressure pump.

- ◆ *The high-pressure pump must first be filled with fuel before the engine is started. The high-pressure pump must not be allowed to run while still empty.*



Note

- ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *Only remove sealing plugs immediately prior to installation of fuel lines.*
- ◆ *There must be sufficient fuel in the tank.*

Proceed as follows to fill fuel system with fuel:

- Connect a ⇒ Vehicle diagnostic tester.
- Switch on ignition.
- Select “Engine electronics” in vehicle self-diagnosis.
- Select “Guided Functions”.
- Then select “Activate fuel pump”.
- Select “120 seconds”.
- The fuel pump starts running.
- Repeat step.
- The fuel pump must run for approx. 4 minutes to ensure that the fuel system is filled sufficiently with fuel.
- Start engine after filling fuel system.
- Run engine at moderate speed for several minutes and then switch off.
- Check fuel system for leaks.
- Erase entry in event memory using ⇒ Vehicle diagnostic tester.
- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

- Interrogate event memory again.

5.4 Checking fuel system for leaks

- Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.



- Check the entire fuel system for leaks.

Renew affected component if leakage still occurs after tightening to correct torque.

- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.



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6 Injectors/high-pressure reservoir (rail)

⇒ [“6.1 Exploded view - injectors”, page 31](#)

⇒ [“6.2 Checking injectors”, page 34](#)

⇒ [“6.3 Performing adaption of correction values for injectors”, page 35](#)

⇒ [“6.4 Checking for injectors sticking open”, page 35](#)

⇒ [“6.5 Checking return flow rate of injectors with engine running”, page 37](#)

⇒ [“6.6 Checking return flow rate of injectors at starter cranking speed”, page 40](#)

⇒ [“6.7 Removing and installing injectors”, page 42](#)

⇒ [“6.8 Removing and installing fuel rail”, page 48](#)

⇒ [“6.9 Installing high-pressure pipes”, page 50](#)

6.1 Exploded view - injectors



Caution

When installing a new base engine, it is essential that the clamping pieces for the injectors are tightened to the specified torque ⇒ [page 31](#) after installing the high-pressure pipes. The clamping pieces are only secured hand-tight at the factory so the injectors can be aligned during installation. If these instructions are not observed, the engine could be damaged.

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1 - Seal

- ☐ In cylinder head cover
- ☐ Renew if leaking ⇒ Rep. gr. 15

2 - Copper seal

- ☐ Always renew copper seal when removing and installing

3 - O-ring

- ☐ Renew

4 - Injector

- ☐ Use a coloured pen to mark allocation of injectors to corresponding clamping piece and high-pressure pipe, and to corresponding cylinder for re-installation; pay attention to markings when installing
- ☐ Always renew copper seal when removing and installing
- ☐ To remove carbon deposits from the injector sealing surface, clean the injector bore in the cylinder head with cleaning kit - VAS 6811- (it is important to do this to avoid leaks)
- ☐ Removing and installing ⇒ [page 42](#)

5 - O-ring

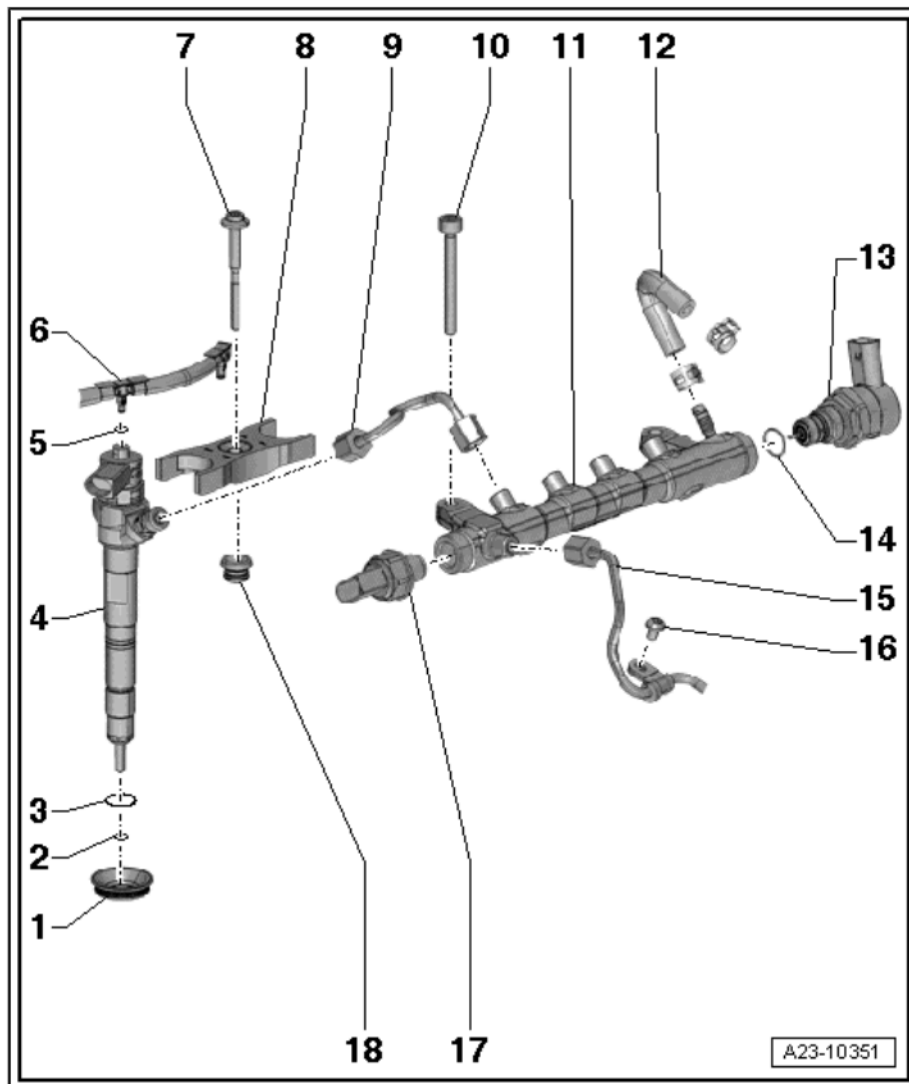
- ☐ Renew

6 - Fuel return line

- ☐ To fuel tank
- ☐ With restrictor
- ☐ Must not be kinked, damaged or clogged
- ☐ Do not dismantle
- ☐ The restrictor maintains a constant residual pressure in the fuel return lines
- ☐ This residual pressure is required for the control function of the injectors
- ☐ After replacement, engine must be run at idling speed for approx. 2 minutes to bleed fuel system. Then check fuel return lines for leaks

7 - Bolt

- ☐ Renew
- ☐ Tighten initially to 2 Nm, then screw on union nuts for high-pressure pipes hand-tight and align injectors
- ☐ Then tighten to final torque (9 Nm + 180°)



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8 - Clamping piece



Caution

*Risk of damage to engine.
When installing a new base engine, it is essential that the clamping pieces for the injectors are tightened to the specified torque ➔ [Item 7 \(page 32\)](#) after installing the high-pressure pipes. The clamping pieces are only secured hand-tight at the factory so the injectors can be aligned during installation.*



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- ☐ Use a coloured pen to mark injectors and corresponding clamping piece and cylinder for re-installation; pay attention to markings when installing
- ☐ The clamping pieces can be re-used when installing new injectors
- ☐ Installation position ➔ [page 34](#)

9 - High-pressure pipe

- ☐ Between fuel rail and injectors



Note

- ◆ *The high-pressure pipe can be re-used after performing the following checks:*
- ◆ *Check taper seat for deformation and cracks.*
- ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- ◆ *Corroded pipes must not be used again.*

- ☐ Install free of stress
- ☐ Lubricate threads of union nuts with clean engine oil
- ☐ 25 Nm

10 - Bolt

- ☐ 22 Nm

11 - Fuel rail

- ☐ Removing and installing ➔ [page 48](#)

12 - Fuel return hose

13 - Fuel pressure regulating valve - N276-

- ☐ Always renew after removing
- ☐ Removing and installing ➔ [page 54](#)
- ☐ 80 Nm
- ☐ After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see "Guided Functions" in ➔ Vehicle diagnostic tester

14 - O-ring

- ☐ Renew

15 - High-pressure pipe

- ☐ Between high-pressure pump and fuel rail



Note

- ◆ *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- ◆ *The high-pressure pipes can be re-used after performing the following checks:*
- ◆ *Check taper seats of high-pressure pipes for deformation and cracks.*
- ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- ◆ *Corroded pipes must not be used again.*

- ☐ Install free of stress
- ☐ Lubricate threads of union nuts with clean engine oil
- ☐ 25 Nm

16 - Bolt

- ☐ 8 Nm

17 - Fuel pressure sender - G247-

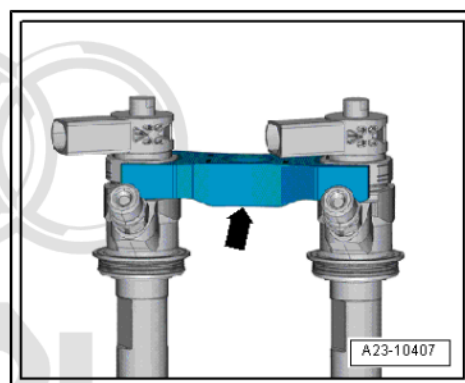
- ☐ Removing and installing ⇒ [page 55](#)
- ☐ 100 Nm

18 - Grommet

- ☐ In cylinder head cover

Installation position of clamping piece

- Each clamping piece secures two injectors.
- The bulge -arrow- of the clamping piece should point downwards.



6.2 Checking injectors

There are four different tests for checking the operation of the injectors.

- Checking adaption of "Injector delivery calibration values" and "Injector voltage calibration values" ⇒ [page 35](#)
- Checking for injectors sticking open ⇒ [page 35](#)
- Checking return flow rate of injectors with engine running ⇒ [page 37](#)
- Checking return flow rate of injectors at starter cranking speed ⇒ [page 40](#)

Perform the following tests first if the engine does not start at all:

- ◆ Checking for injectors sticking open ⇒ [page 35](#)
- ◆ Checking return flow rate of injectors at starter cranking speed ⇒ [page 40](#)
- ◆ Checking fuel pressure regulating valve - N276- ⇒ [page 52](#)

6.3 Performing adaption of correction values for injectors

The "Injector delivery calibration values" function serves to correct the injection rates for each cylinder of a common rail system individually across the entire operating range.

The 7-digit adaption values -1- (details in illustration are only an example) are marked separately on each injector. The values may consist of letters and/or numbers.

Injector (view from above)

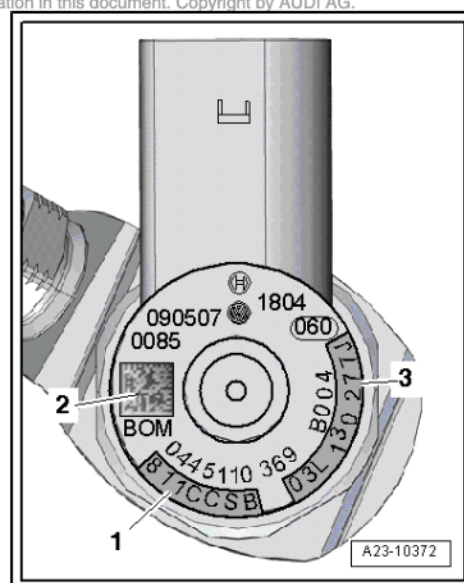
- 1 - Adaption value (checksum)
- 2 - Data matrix code
- 3 - Part number

When a new injector is installed, the adaption value must be written into the engine control unit.

When a new engine control unit is installed, the "Adaption values for injectors" must be written into the new control unit.

Additionally, check that the "injector delivery calibration values" are correctly entered for all the other injectors. Do NOT attempt to re-enter these values if the correct values are already stored in the engine control unit.

The adaption procedure is described in the Guided Fault Finding. (The procedure is also described in Guided Functions.) Use ⇒ Vehicle diagnostic tester

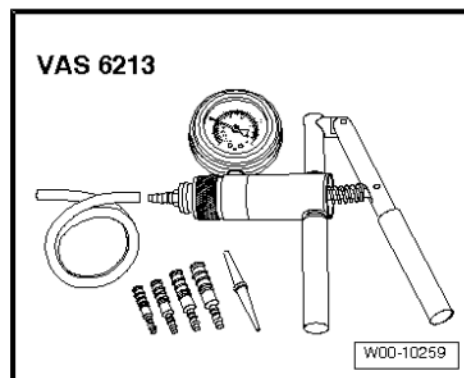


6.4 Checking for injectors sticking open

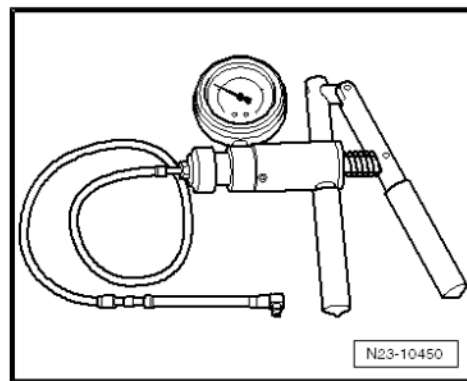
If one of the injectors is sticking open, this means that the injector needle is not closing fully and fuel escapes into the cylinder.

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-



- ◆ Use a return line to make an -adapter-.



Caution

- ◆ Observe ⇒ [page 2](#) .
- ◆ Risk of malfunctions caused by dirt.

- Erase entry in event memory using ⇒ Vehicle diagnostic tester.
- Pull off engine cover panel ⇒ [page 16](#) .
- Clean all connections (with commercial cleaning solution or similar) before removing.

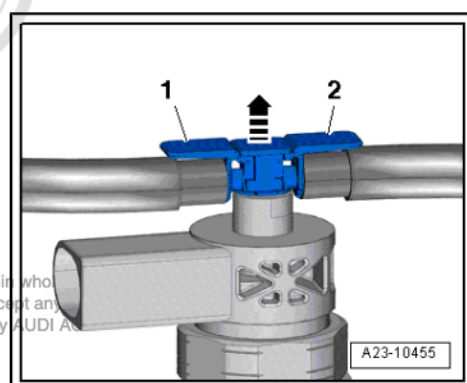


Note

- ◆ Make sure all parts are clean; no dirt must be allowed to enter the fuel system.
- ◆ Check all cylinders in turn.
- Dry all components after cleaning.

Start with cylinder No. 1.

- Pull return line connections off injectors; to do so, press tabs -1- and -2- down and at the same time pull release pin upwards -arrow-.
- Connect adapter to return line connection of injector to be tested after adapter has been cleaned and blown out.



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- Generate a vacuum of -500 mbar using the hand vacuum pump - VAS 6213- .

If the vacuum reading remains the same for 30 seconds, the injector is OK.

If the injector is faulty, the vacuum reading will fall back to 0 bar within 2 to 3 seconds.

Repeat test if necessary; note drop in vacuum reading on hand vacuum pump - VAS 6213- .

- Renew faulty injectors ➔ [page 42](#) .

Installing fuel return lines

- Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.



Note

Lubricate all seals with engine oil or assembly oil before installing.

- Push the return line connections carefully over the new seals and onto the injectors. The catch should engage audibly. Then press release pin down carefully.

Bleeding fuel system and checking for leaks

- Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.
- Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

6.5 Checking return flow rate of injectors with engine running

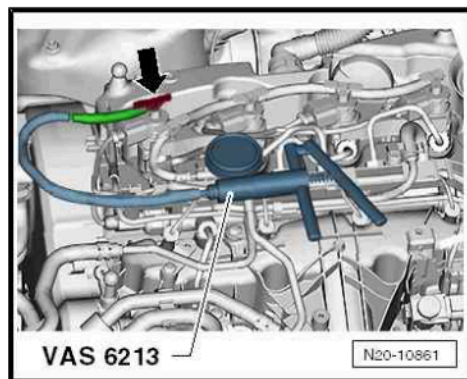
Checking return flow rate of all injectors



Caution

- ◆ Observe ➔ [page 2](#) .
- ◆ Risk of malfunctions caused by dirt.

- Pull off engine cover panel ➔ [page 16](#) .
- Disconnect hose connection at fuel line.



- Seal off open return line connection with a clean plug -2-.
- Hold end of fuel return hose -1- (lengthen if necessary) in a measuring container to measure the total return flow rate.
- Start engine and let it idle for 2 minutes.
 - Specification for 2 minutes: 0 ml to 50 ml
- If specification is attained, increase engine speed to 2000 ... 2500 rpm for approx. 2 minutes and then check return flow rate again.
 - Specification for 2 minutes: less than 250 ml



Note

1000 ml = 1 litre

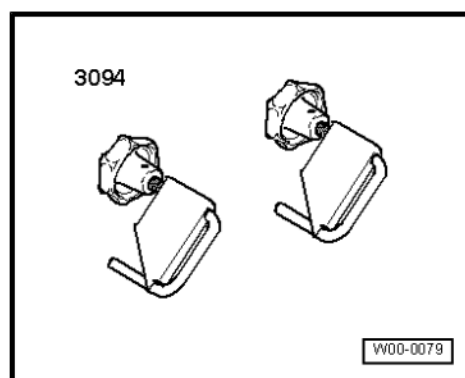
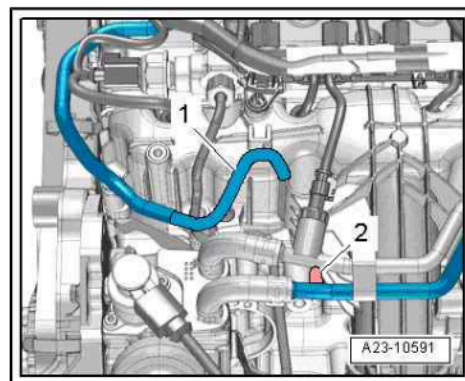
If specification is exceeded, this indicates that one or more injectors are defective. Check return flow rate from each injector individually.

Checking return flow rate of individual injectors

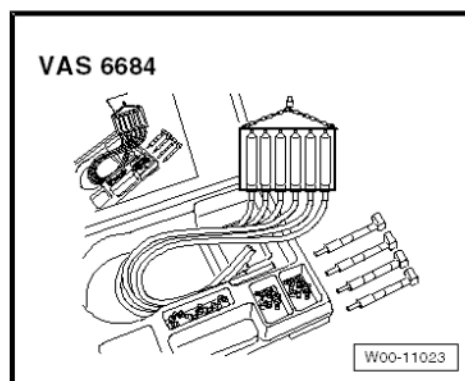
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Special tools and workshop equipment required

- ◆ Hose clamps, up to 25 mm - 3094-



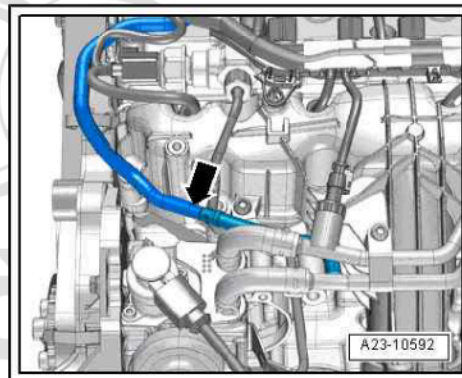
- ◆ Return flow meter - VAS 6684-



Each injector normally has a relatively low return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

- Clean all return line connections (e.g. with commercial cleaning solution etc.) before removing.
- Dry all components after cleaning.

- Clamp off fuel return hose -arrow- using a hose clamp -3094- .



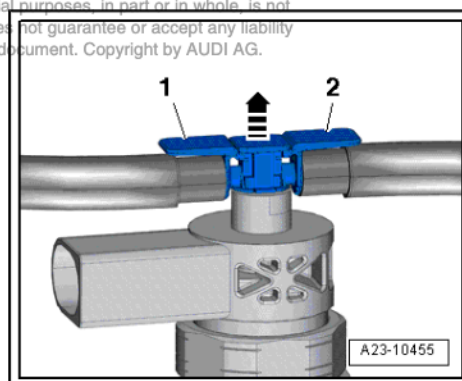
- Pull return line connections off injectors; to do so, press tabs -1- and -2- down and at the same time pull release pin upwards -arrow-.
- Connect hoses of return flow meter - VAS 6684- to return line connections of all three injectors.



Caution

Risk of damage to injectors when return lines are disconnected.

- ◆ *Do NOT press the accelerator during this test; the engine must only run at idling speed.*



- Start engine and let it idle for several minutes.

- When the engine is warm and running at idling speed, the return flow rates at each of the 4 return lines must not differ by more than a small amount.
- If one injector has a significantly higher return flow rate than the others it must be renewed ⇒ [page 42](#) .

Installing fuel return lines

- Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.



Note

Lubricate all seals with engine oil or assembly oil before installing.

- Push return line connections carefully onto injectors. The catch should engage audibly. Then press release pin down carefully.
- Erase entry in event memory using ⇒ Vehicle diagnostic tester.

Bleeding fuel system and checking for leaks

- Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.
- Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.

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Note

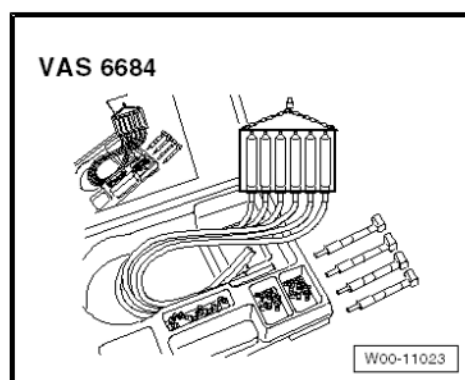
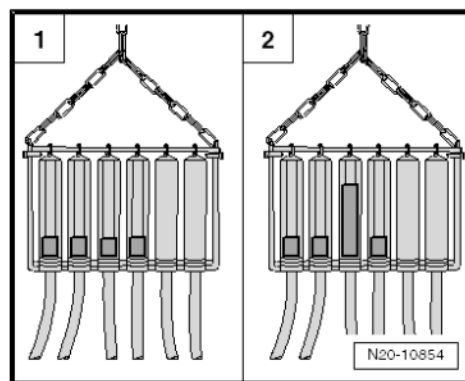
If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

6.6 Checking return flow rate of injectors at starter cranking speed

Only perform this test if the engine does not start at all.

Special tools and workshop equipment required

- ◆ Return flow meter - VAS 6684-





Caution

- ◆ *Observe ➔ [page 2](#).*
- ◆ *Risk of malfunctions caused by dirt.*

Procedure

Each injector normally has a relatively low return flow rate. If the return flow rate at one injector is relatively high compared to the other injectors, that injector is probably defective.

- Pull off engine cover panel ➔ [page 16](#).
- Clean all return line connections (e.g. with commercial cleaning solution etc.) before removing.
- Dry all components after cleaning.



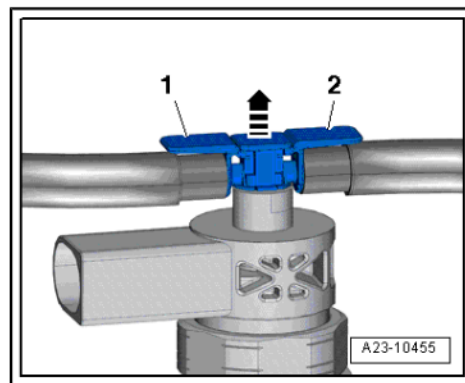
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- Pull return line connections off injectors; to do so, press tabs -1- and -2- down and at the same time pull release pin upwards -arrow-.
- Connect hoses of return flow meter - VAS 6684- to return line connections of all four injectors.
- Operate starter three times (wait approx. 20 seconds each time after operating starter to prevent it from overheating).
 - Specification of return flow rate: 0 ml
- If fuel comes out of one injector, that injector must be renewed.

Installing fuel return lines

- Check O-ring for fuel return line connection for damage and deformation.

If O-ring is damaged or deformed, renew O-ring.



Note

Lubricate all seals with engine oil or assembly oil before installing.

- Push return line connections carefully onto injectors. The catch should engage audibly. Then press release pin down carefully.
- Erase entry in event memory using ➔ Vehicle diagnostic tester.

Bleeding fuel system and checking for leaks

- Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.
- Check the entire fuel system for leaks.

Renew the affected component if leakage occurs.

- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

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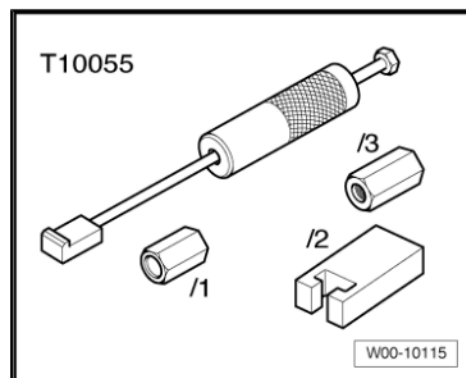
If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

6.7 Removing and installing injectors

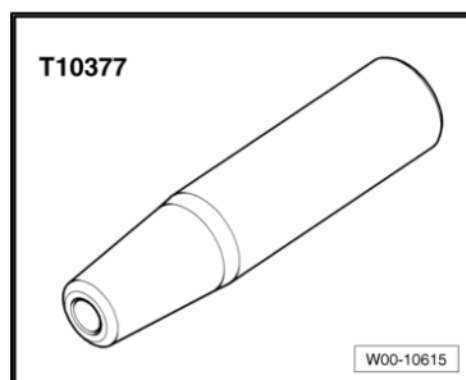
Special tools and workshop equipment required

- ◆ Cleaning kit - VAS 6811-

◆ Puller - T10055-



◆ Assembly sleeve - T10377-



◆ Puller -T10415-

Removing



Caution

- ◆ Observe ➔ [page 2](#).
- ◆ Risk of malfunctions caused by dirt.

- Pull off engine cover panel ➔ [page 16](#).



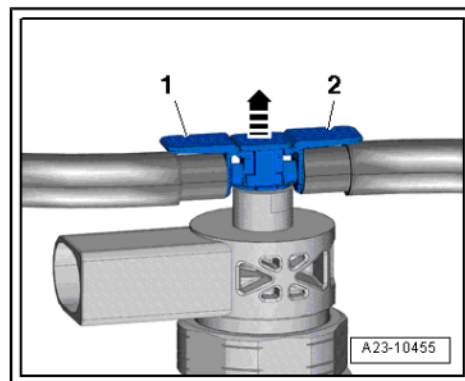
Caution

- ◆ Mark cylinder numbers on injector units. They must always be re-installed on the same cylinders.
- ◆ Observe rules for cleanliness when working on the injection system.
- ◆ Plug open connections with suitable sealing caps immediately.

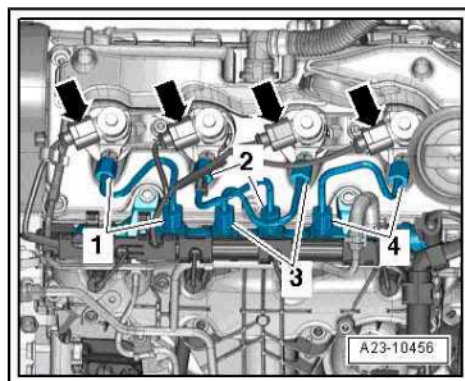
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- Pull return line connections off injectors; to do so, press tabs -1- and -2- down and at the same time pull release pin upwards -arrow-.



- Unplug electrical connectors -arrows- at injectors.
- Loosen union nuts of high-pressure pipes -1 to 4-.



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- Unscrew bolt -1- for clamping piece.



Note

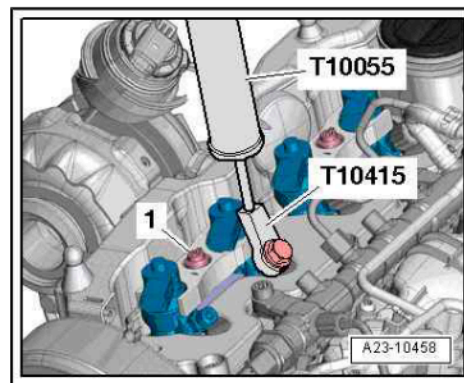
Leave clamping piece in position until adjacent injector is detached.



Caution

Risk of damage to injector if clamping piece is not kept straight.

- ◆ *First detach injectors for cylinders 2 and 4; then detach injectors for cylinders 1 and 3, and at the same time detach clamping piece.*



- Apply puller - T10055- with puller -T10415- as shown in illustration, and pull out injector upwards.



Note

To avoid damaging the sealing lip, rotate the injector while pulling it out.

- After removal, lay injectors on a clean cloth.

Important instructions for installing injectors:

When installing injectors, the following components must be renewed:

- ◆ Bolt for clamping piece
- ◆ Copper seal
- ◆ O-ring for injector bore
- ◆ O-ring for fuel return line connection

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Note

- ◆ *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- ◆ *The high-pressure pipes can be re-used after performing the following checks:*
- ◆ *Check taper seats of high-pressure pipes for deformation and cracks.*
- ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- ◆ *Corroded pipes must not be used again.*

If a used injector is being re-installed:

- Spray tip of injector nozzle with rust-releasing spray. Wait approx. 5 minutes and wipe off soot particles and oil with a cloth.
- To remove the old copper seal from the injector, clamp the seal carefully in a vice so that it is just held between the jaws without turning. Then carefully pull and twist the injector out of the copper seal by hand.
- Clean off deposits under the copper seal using a suitable scraper.



Caution

Risk of damage to injector sealing surface.

- ◆ *To remove carbon deposits from the injector sealing surface, clean the injector bore in the cylinder head with cleaning kit - VAS 6811- .*



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- Renew O-ring for injector bore using assembly sleeve - T10377- .



Note

If injector seals in cylinder head cover are damaged, they must be renewed ⇒ Rep. gr. 15 .

- Install injectors.
- Slide clamping piece onto injectors; observe installation position.
- Always insert 2 injectors with clamping piece carefully into bores in cylinder head.
- Hand-tighten union nuts on high-pressure pipes. Make sure that connections are not under tension.
- Tighten clamping piece to specified torque.
- Tightening torque for clamping piece:
⇒ ["6.1 Exploded view - injectors", page 31](#)
- Press return line connections carefully over seals and onto injectors (check seal for damage before connecting return line). The catch should engage audibly. Then press release pin down carefully.

After renewing one or more injectors, the "injector delivery calibration values" and "injector voltage calibration values" for the new injectors must be written into the engine control unit.

Additionally, check that the "injector delivery calibration values" and "injector voltage calibration values" are correctly entered for all the other injectors. Do NOT attempt to re-enter these calibration values if the correct values are already stored in the engine control unit.

Bleeding fuel system and checking for leaks



Note

The fuel system is self-bleeding; do not open the high-pressure connections.

- Run engine at idling speed for several minutes and then switch off.
- Switch off ignition.
- Check the complete fuel system including all 4 return line connections for leaks.

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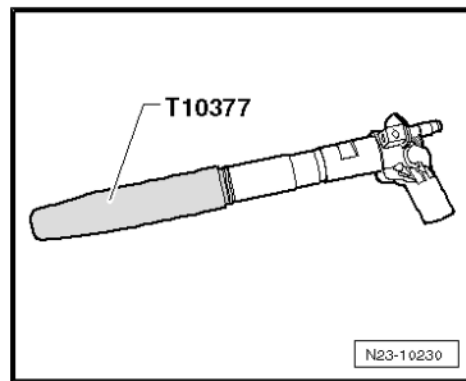
Renew affected component if leakage still occurs after tightening to correct torque.

- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

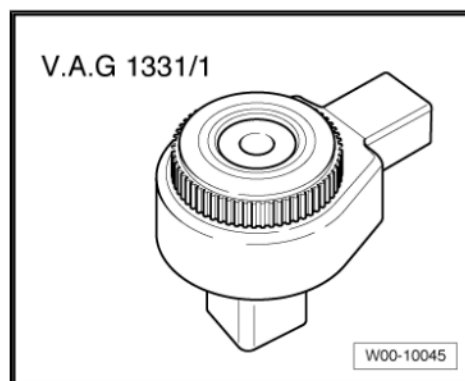




6.8 Removing and installing fuel rail

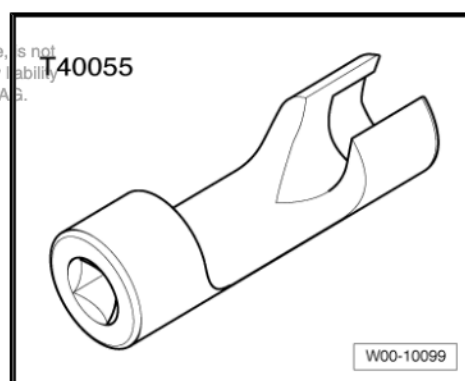
Special tools and workshop equipment required

- ◆ Ratchet - V.A.G 1331/1-



- ◆ Socket - T40055-

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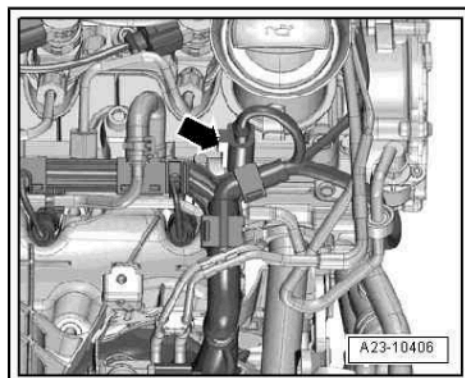
Removing



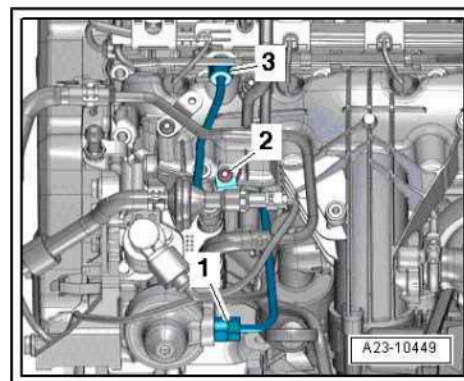
Caution

- ◆ *Observe ➔ [page 2](#) .*
- ◆ *Risk of malfunctions caused by dirt.*

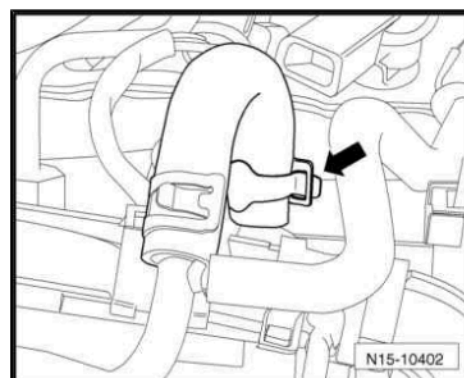
- Pull off engine cover panel ➔ [page 16](#) .
- Unplug electrical connector -arrow- at fuel pressure regulating valve - N276- .



- Remove bolt -2- and union nuts -1 and 3- and detach high-pressure pipe.



- Release hose clip -arrow- and detach fuel return hose from fuel rail.
- Seal off open fuel return hose with a clean plug.



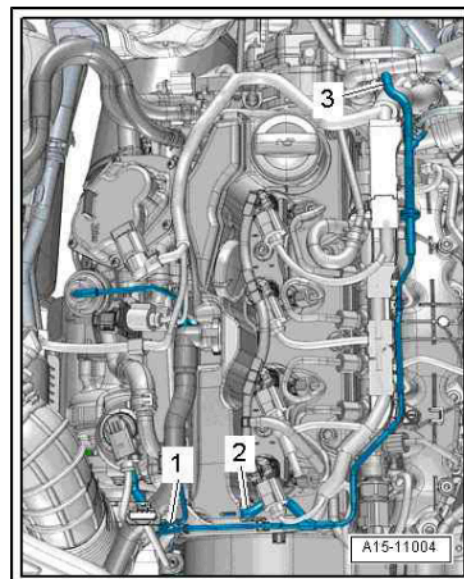
- Detach vacuum hose -3- and move clear.



Note

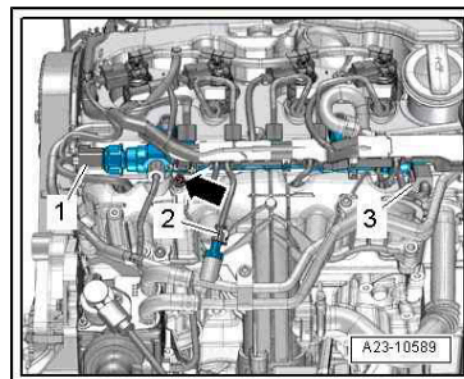
Disregard -items 1, 2-.

- Unplug electrical connectors on glow plugs ➔ [page 68](#) .



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- Unplug electrical connectors -1, 2, 3-.
- Remove bolt -arrow- and move wiring retainer with electrical wiring harness clear and press to one side.
- Loosen union nuts for high-pressure pipes using socket -T40055- .



- Remove union nuts -1- and bolts -arrows- and detach fuel rail.
- Set removed fuel rail (with high-pressure pipes attached) down on a clean cloth.
- Seal off openings in fuel rail with clean plugs.

Installing

Installation is carried out in the reverse order; note the following:

- Install high-pressure pipes so they are free of stress.



Note

- ◆ *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- ◆ *The high-pressure pipes can be re-used after performing the following checks:*
- ◆ *Check taper seats of high-pressure pipes for deformation and cracks.*
- ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- ◆ *Corroded pipes must not be used again.*

Tightening torques

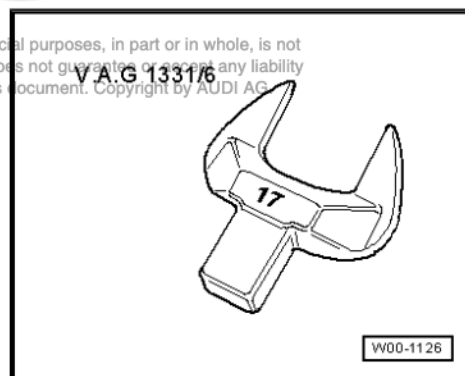
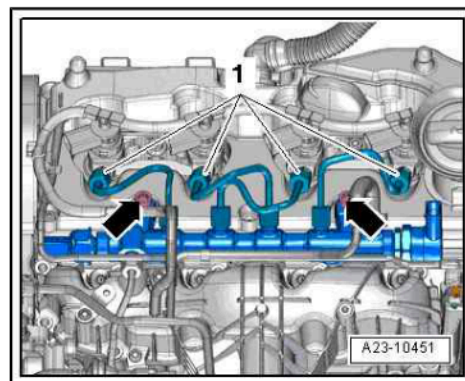
- ◆ ⇒ ["6.1 Exploded view - injectors", page 31](#)

6.9 Installing high-pressure pipes

Special tools and workshop equipment required

- ◆ Open end spanner insert, AF 17 - V.A.G 1331/6-

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Procedure



Note

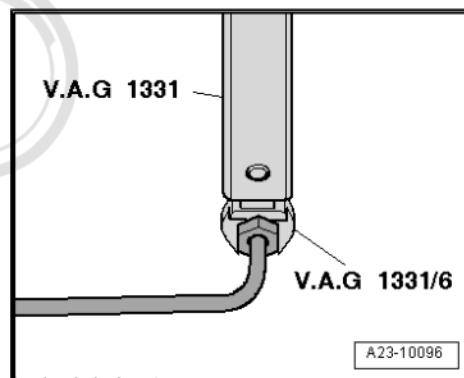
- ◆ *Note identification marks for cylinder allocation when re-installing high-pressure pipes.*
- ◆ *The high-pressure pipes can be re-used after performing the following checks:*
- ◆ *Check taper seats of high-pressure pipes for deformation and cracks.*
- ◆ *The bore of the pipe must not be distorted, restricted or otherwise damaged.*
- ◆ *Corroded pipes must not be used again.*

- Use vacuum cleaner to remove dirt from taper seat at fuel rail.
- Clean fuel pipe and end of pipe using cleaning solution and dry with compressed air.
- Lubricate threads of union nuts with fuel.
- Hand-tighten union nuts on high-pressure pipes (ensure that pipes are not under tension).

Tightening torques

◆ ⇒ ["6.1 Exploded view - injectors", page 31](#)

- To tighten unions of high-pressure pipes to fuel rail and injectors, use torque wrench - V.A.G 1331- with open end spanner insert, AF 17 - V.A.G 1331/6- .
- Check fuel system for leaks ⇒ [page 29](#) .



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7 Senders and sensors

⇒ ["7.1 Checking fuel pressure regulating valve N276 "](#),
[page 52](#)

⇒ ["7.2 Removing and installing fuel pressure regulating valve
N276 "](#), [page 54](#)

⇒ ["7.3 Removing and installing fuel pressure sender G247 ", page
55](#)

7.1 Checking fuel pressure regulating valve - N276-

Special tools and workshop equipment required

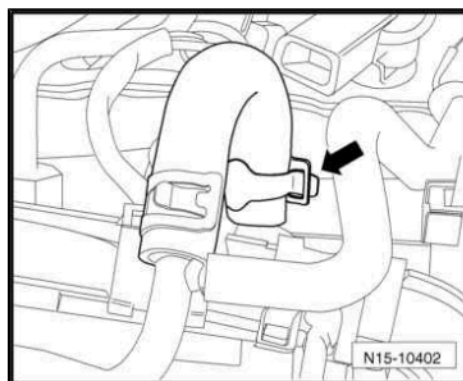
- ◆ Fuel-resistant measuring container



Caution

- ◆ *Observe ⇒ [page 2](#) .*
- ◆ *Risk of malfunctions caused by dirt.*

- Pull off engine cover panel ⇒ [page 16](#) .
- Release hose clip -arrow- and detach fuel return hose from fuel rail.
- Seal off open fuel return hose with a clean plug.



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- Connect test hose -2- to return line connection of fuel rail -3-.
- Seal off open fuel return hose -1- with a clean plug.
- Hold end of test hose into measuring container -4- to measure return flow rate.

1) Checking while engine is running

- Start the engine and run at idling speed.
- Specification: more than 75 ml in 30 seconds

If specification is not obtained, fuel pressure regulating valve - N276- is defective.

2) Checking while engine is running

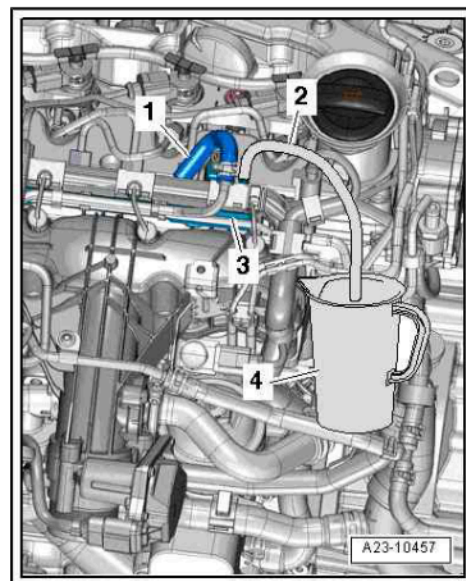
If condition for 1) is met, increase engine speed to ≥ 2000 rpm.

- Specification of return flow rate: 0 ml
- Drip leaks are permissible
- If specification is not obtained, fuel pressure regulating valve - N 276- is defective.

3) If engine can no longer be started

Perform check at cranking speed.

- Specification of return flow rate: 0 ml
- Drip leaks are permissible
- If specification is not obtained, fuel pressure regulating valve - N 276- is defective.



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7.2 Removing and installing fuel pressure regulating valve - N276-

The fuel pressure regulating valve - N276- -arrow- is located in the fuel rail. It maintains a constant pressure in the fuel rail and the injector pipes (high-pressure fuel circuit).

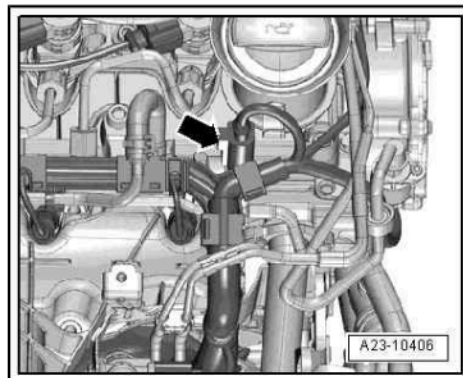
If the pressure in the high-pressure fuel circuit is too high, the regulating valve opens to allow some of the fuel to flow back from the fuel rail to the fuel tank via a return line.

If the pressure in the high-pressure fuel circuit is too low, the fuel pressure regulating valve - N276- closes and seals off the high-pressure section of the system from the low-pressure section.



Note

Fuel pressure regulating valve - N276- must always be renewed after it has been removed.



Removing



Caution

- ◆ Observe ⇒ [page 2](#) .
- ◆ Risk of malfunctions caused by dirt.

- Remove fuel rail ⇒ [page 48](#) .
- Before removal, clean area around thread for fuel pressure regulating valve - N276- using commercial cleaning solution or similar (no dirt must enter opening in fuel rail).



Note

Clean carefully; cleaning solution must not enter the electrical connector.

- Dry off fuel pressure regulating valve - N276- .
- Slacken union nut (counterhold at hexagon flats on housing). Then unscrew and remove by hand.
- Extract dirt from opening in fuel rail (thread and sealing surface) using a vacuum cleaner. Do not use metal tools, etc.
- Seal off opening in fuel rail with a clean plug.

Installing

Tightening torques

- ◆ ⇒ ["6.1 Exploded view - injectors", page 31](#)



Note

- ◆ *The fuel pressure regulating valve - N276- has a deformable sealing lip and no separate seal; it can therefore be used only once.*
- ◆ *Check that sealing surfaces (deformable sealing lip) and threads on new fuel pressure regulating valve - N276- are not damaged.*
- ◆ *Check sealing surface at opening in fuel rail.*
- ◆ *The beginning of the thread, the deformable sealing lip and the O-ring of the fuel pressure regulating valve - N276- must be coated with diesel fuel.*
- Screw on union nut by hand.
- Align new regulating valve so that connecting wire is free of tension after connector is attached.
- Hold regulating valve in this position by holding hexagon flats on housing of regulating valve with open-end spanner or pliers (water pump pliers or similar).
- Use suitable torque wrench with an open-end spanner insert (30 mm) to tighten union nut.
- Install fuel rail ⇒ [page 48](#) .

After renewing high-pressure pump or fuel pressure regulating valve - N276- , learnt values must be re-adapted; see "Guided Functions" in ⇒ Vehicle diagnostic tester

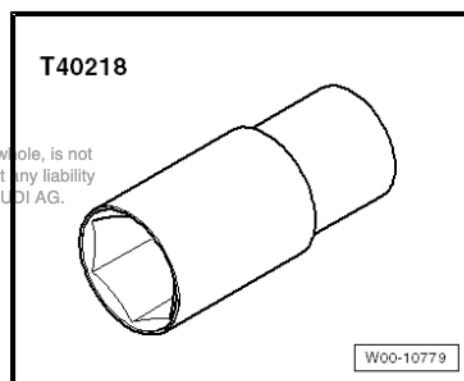
- After installation, run engine at moderate speed for several minutes and then switch off.
- Check fuel system for leaks.
- Interrogate event memory.
- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.
- Interrogate event memory again.

7.3 Removing and installing fuel pressure sender - G247-

Special tools and workshop equipment required

- ◆ Bit (27 mm) - T40218- or commercially available socket (27 mm)

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- ◆ Torque wrench



Note

- ◆ *The fuel pressure sender - G247- continuously measures the fuel pressure in the high-pressure system. It transmits a corresponding voltage signal to the engine control unit - J623- .*
- ◆ *Should the fuel pressure sender fail, the engine control unit will control the fuel pressure via a mapped open-loop backup function. Maximum engine speed in this mode is restricted.*
- ◆ *The fuel pressure sender - G247- has a deformable sealing lip.*

Removing



Caution

- ◆ *Observe ➔ [page 2](#) .*
- ◆ *Risk of malfunctions caused by dirt.*

- Pull off engine cover panel ➔ [page 16](#) .
- Before removal, clean area around thread for fuel pressure sender using commercial cleaning solution etc. (no dirt must enter opening).



Note

Clean carefully; cleaning solution must not enter the electrical connector.

- Dry off fuel pressure sender - G247- .



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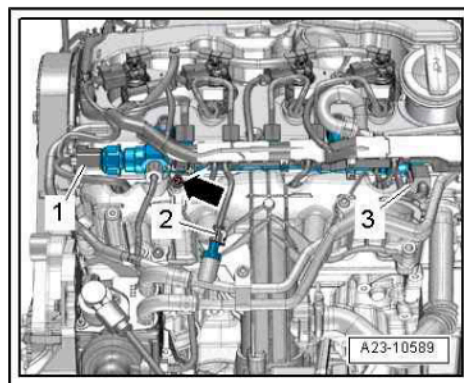
- Unplug electrical connector -1- at fuel pressure sender - G247- .
- Unscrew fuel pressure sender - G247- using socket, 27 mm - T40218- .



Note

An open-end spanner must not be used for loosening or tightening.

- Extract dirt from opening in fuel rail (thread and sealing surface) using a vacuum cleaner. Do not use metal tools, etc.



Note

Disregard -item A-.

Installing



Note

- ◆ *The fuel pressure sender - G247- does not have a seal; instead, it has a deformable sealing lip.*
- ◆ *Check that sealing surfaces (deformable sealing lip) and threads on fuel pressure sender - G247- are not damaged. If inspection of fuel pressure sender - G247- shows that it is OK, it can be used again.*
- ◆ *Also check sealing surface at opening in fuel rail.*
- ◆ *The beginning of the thread and the deformable sealing lip of the fuel pressure regulating valve - N276- must be coated with diesel fuel.*

- Screw in fuel pressure sender - G247- by hand.
- Then tighten fuel pressure sender - G247- to specified torque.

Tightening torques

- ◆ ➔ ["6.1 Exploded view - injectors", page 31](#)
- After installing fuel pressure sender - G247- , leave engine running at moderate speed for a few minutes when bleeding fuel system and then switch off again.



Note

The fuel system is "self-bleeding"; do NOT open the high-pressure connections.

- Interrogate event memory and erase it if necessary.
- Switch off ignition.
- Carefully check the entire fuel system for leaks.
- Renew affected component if leakage still occurs after tightening to correct torque.
- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then check the high-pressure section of the fuel system again for leaks.



Note

If there is any air left in the fuel system, the engine may switch to the backup mode ('emergency running' mode) during the road test. Switch off the engine and erase the event memory. Then continue the road test.

- After road test, interrogate event memory again.



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8 Lambda probe

⇒ "8.1 Exploded view - Lambda probe and exhaust gas temperature senders", page 59

⇒ "8.2 Removing and installing Lambda probe G39 with Lambda probe heater Z19", page 60

⇒ "8.3 Removing and installing pressure differential sender G505", page 61

8.1 Exploded view - Lambda probe and exhaust gas temperature senders

1 - Turbocharger

- ☐ With position sender for charge pressure positioner - G581-

2 - Lambda probe - G39- with Lambda probe heater - Z19-

- ☐ Removing and installing ⇒ [page 60](#)
- ☐ New Lambda probes are coated with an assembly paste
- ☐ If you are re-using Lambda probe, coat only thread with high-temperature paste; refer to ⇒ Electronic parts catalogue for high-temperature paste
- ☐ The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body
- ☐ 55 Nm

3 - Exhaust gas temperature sender 3 - G495-

- ☐ Removing and installing ⇒ Rep. gr. 26

4 - Pressure differential sender - G505-

- ☐ Removing and installing ⇒ [page 61](#)
- ☐ Pressure pipes to particulate filter: 45 Nm
- ☐ Tighten bolt to 4.5 Nm

5 - Exhaust gas temperature sender 4 - G648-

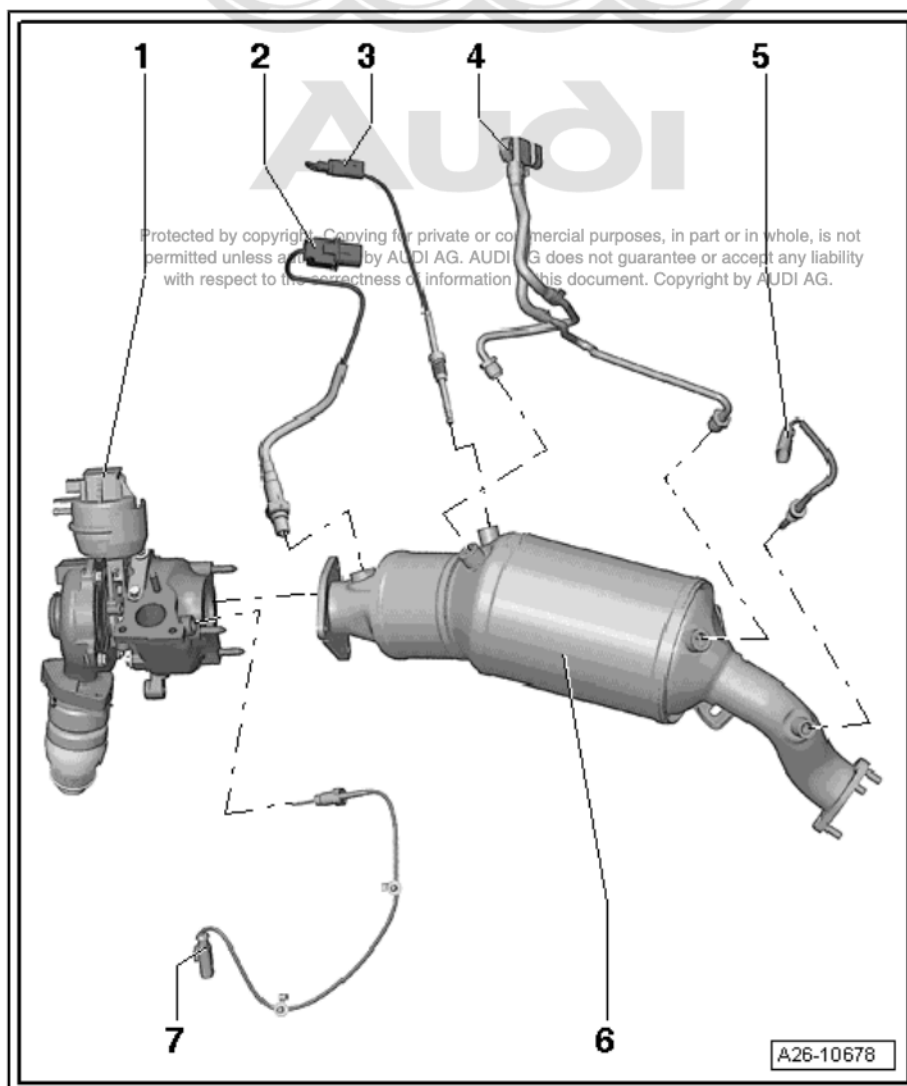
- ☐ Removing and installing ⇒ Rep. gr. 26

6 - Particulate filter

- ☐ Adaption must be performed after renewing particulate filter. Use ⇒ Vehicle diagnostic tester

7 - Exhaust gas temperature sender 1 - G235-

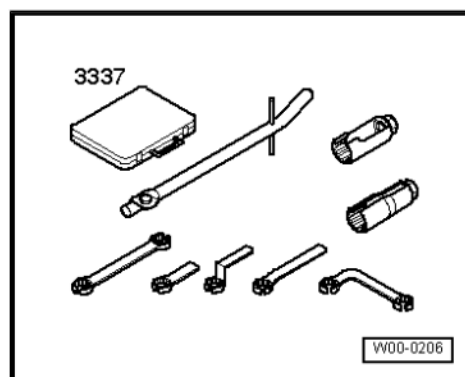
- ☐ Removing and installing ⇒ Rep. gr. 26



8.2 Removing and installing Lambda probe - G39- with Lambda probe heater - Z19-

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-



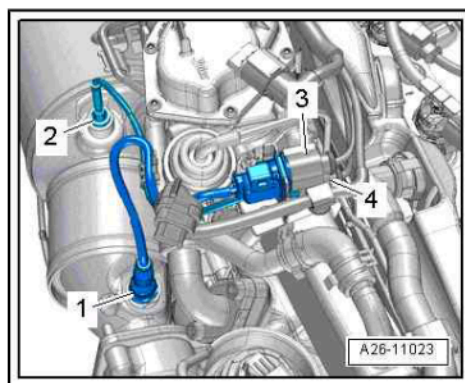
Removing

- Pull off engine cover panel ➔ [page 16](#) .
- Unplug electrical connector -3- for Lambda probe - G39- and move electrical wiring clear.
- Unscrew Lambda probe - G39- -item 1- using a tool from Lambda probe open ring spanner set - 3337- .



Note

Disregard -items 2, 4-.



Installing

Installation is carried out in the reverse order; note the following:

Tightening torques

- ◆ ➔ ["8.1 Exploded view - Lambda probe and exhaust gas temperature senders", page 59](#)



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. For high-temperature paste refer to ➔ [Electronic parts catalogue](#)*
- ◆ *When installing, the Lambda probe wiring must always be re-attached at the same locations to prevent it from coming into contact with the exhaust pipe.*

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8.3 Removing and installing pressure differential sender - G505-



Note

The pressure differential sender - G505- detects the amount of deposits in the particulate filter.

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester

Removing

- Pull off engine cover panel ➔ [page 16](#) .
- Unplug electrical connector -3-.
- Unscrew bolt -2- and detach pressure differential sender - G505- .
- Before disconnecting, spray hoses coming from exhaust gas pressure sensor 1 - G450- with suitable release agent.
- Carefully disconnect the hoses from their connections (take care to keep the hoses straight: the connections on pressure sensor can break off easily).

Installing

Installation is carried out in the reverse order; note the following:

Tightening torques

- ◆ ➔ [“8.1 Exploded view - Lambda probe and exhaust gas temperature senders”, page 59](#)



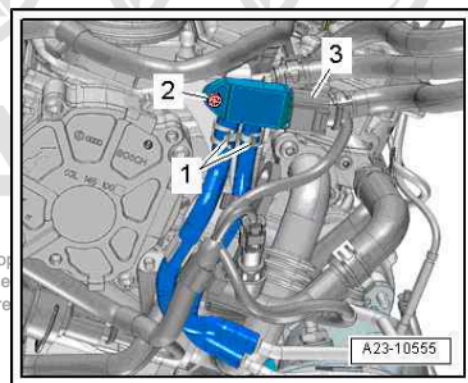
Note

- ◆ *Before installing, blow out pressure pipes from pressure differential sender - G505- to particulate filter towards particulate filter with compressed air (pipes can become obstructed or may ice up due to condensation).*
- ◆ *Make sure that hoses are securely fitted and that there are no leaks.*
- ◆ *If pressure pipes are detached from particulate filter, tighten pressure pipe connections ➔ Rep. gr. 26 .*
- “Adaption” must be performed after renewing pressure differential sender ➔ Vehicle diagnostic tester.

Adaption must be performed after renewing pressure differential sender - G505- and/or particulate filter. (The procedure is described in Guided Functions.)

After renewing pressure differential sender - G505- and/or particulate filter, adaption must be performed in order to reset learnt values. The adaption procedure is described in the Guided Fault Finding or Guided Functions.

Use ➔ Vehicle diagnostic tester.



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9 Engine control unit

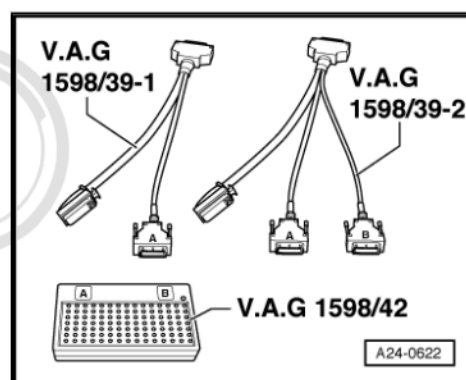
⇒ ["9.1 Wiring and component check with test box V.A.G 1598/42", page 62](#)

⇒ ["9.2 Removing and installing engine control unit J623", page 63](#)

9.1 Wiring and component check with test box - V.A.G 1598/42-

Special tools and workshop equipment required

- ◆ Adapter cable - V.A.G 1598/39-1-
- ◆ Adapter cable - V.A.G 1598/39-2-
- ◆ Test box - V.A.G 1598/42-

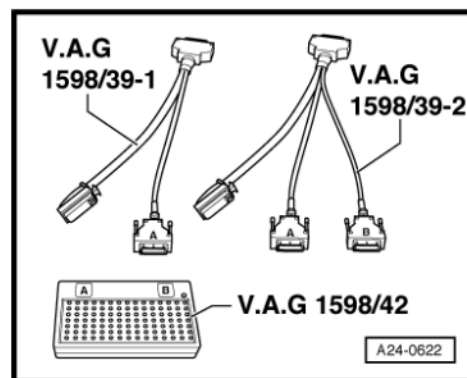


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Note

- ◆ The test box has 105 sockets. The connecting cable can be disconnected from the test box. This means that only the cable (and not the test box) has to be purchased for future engine control units with different types of connectors.
- ◆ The smaller of the two connectors on the engine control unit has the contacts 1 to 60. The larger of the two connectors has the contacts 1 to 94.
- ◆ To carry out tests on the 60-pin wiring harness connector, the adapter cable - V.A.G 1598/39-1- is connected to connector "A" on the test box. For components connected to 60-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ To carry out tests on the 94-pin wiring harness connector, the adapter cable - V.A.G 1598/39-2- must be connected to connectors -A- and -B- on the test box. For components connected to 94-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ The test box - V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time.
- ◆ The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).
- ◆ The relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.



WARNING

To prevent irreparable damage to the electronic components, select appropriate measuring range before connecting the measuring cables and observe the test requirements.

- Remove engine control unit ⇒ [page 63](#) .
- Connect test box - V.A.G 1598/42- to wiring harness with adapter cable - V.A.G 1598/39-1- or adapter cable - V.A.G 1598/39-2- . Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in appropriate repair procedures.

Perform the following after reconnecting engine control unit:

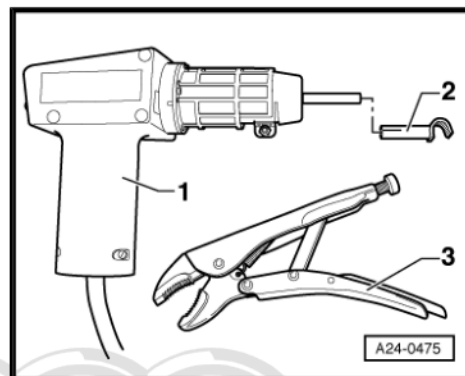
- Interrogate event memory and erase if necessary.

9.2 Removing and installing engine control unit - J623-

Special tools and workshop equipment required

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- ♦ Hot air blower - VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set - VAS 1978 B-

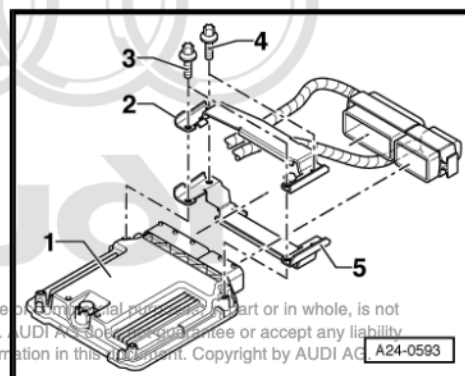


- ♦ Small, commercially available mole grips -3-



Note

- ♦ *Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/gearbox combination.*
- ♦ *The engine control unit -1- is bolted to the protective housing -5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.*
- ♦ *The protective housing has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).*



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Removing

- Before removing the engine control unit - J623- , the adaption values of the injectors and the ash deposit mass must be read out. Use ⇒ Vehicle diagnostic tester.

The adaption values for the injectors in the old (defective) engine control unit can be read out via the Guided Fault Finding or Guided Functions mode and can be stored as an electronic file in the vehicle diagnostic tester.

- Switch off ignition and remove ignition key after storing electronic file containing adaption values.

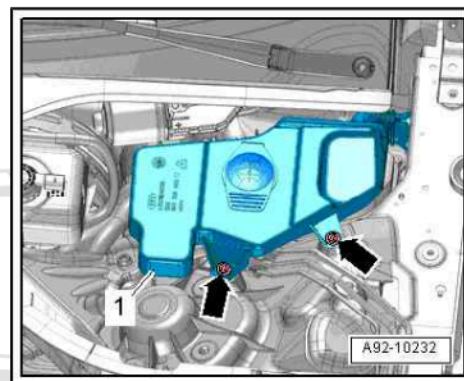


Note

If the adaption values of the injectors cannot be read out of the old (defective) engine control unit, they must be entered into the new engine control unit manually and the adaption procedure must be performed accordingly.

- Remove plenum chamber cover ⇒ Rep. gr. 50 .

- Unscrew bolts -arrows- and pull filler neck out of washer fluid reservoir and through opening in body to right side.



- Release catch -arrow- and detach engine control unit - J623-
 -item 1-.

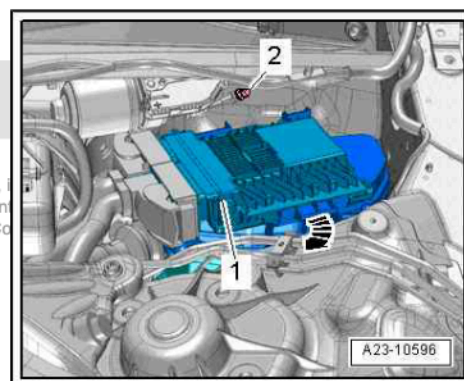


Note

Disregard -item 2-.

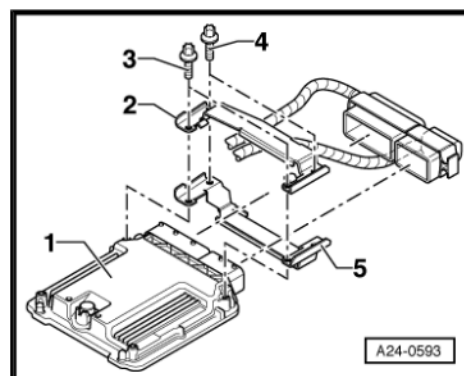
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Perform the following work steps if a protective housing is fitted:



The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.

The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.

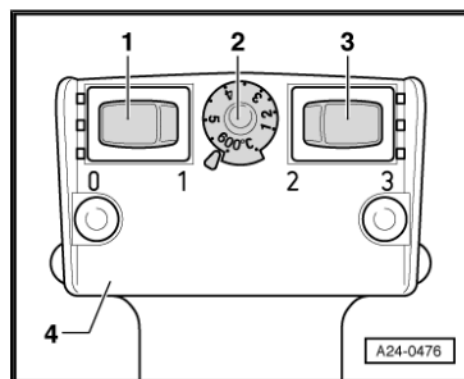


- Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.

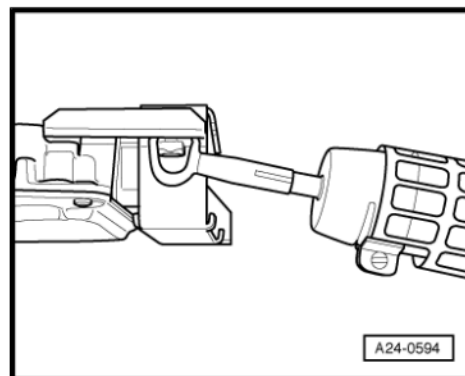


WARNING

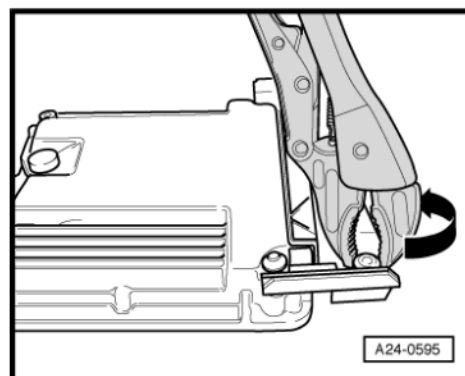
Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.



- Apply heat to the threads of the shear bolts on the connector side for approx. 25 to 30 seconds.



- Unscrew shear bolts using suitable vice-grip pliers (see arrow in illustration).
- The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
- Detach protective housing from control unit connectors.
- Release connectors on engine control unit and unplug connectors.
- Take out old engine control unit - J623- and install new engine control unit - J623- .



Installing

Installation is performed in the reverse sequence.

- It is important that the protective housing is re-fitted on the engine control unit - J623- (if fitted previously).
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.
- After the engine control unit - J623- has been renewed, the "Injector delivery calibration" and the "Injector voltage calibration" must also be re-adapted in the engine control unit (these functions influence engine power and exhaust emissions).
- On vehicles with particulate filter the current mileage (km) reading must be stored in the engine control unit - J623- via an adaption procedure.

After installing a new engine control unit, the following operation must be performed:

- Activate engine control unit using ➔ Vehicle diagnostic tester in "Guided Functions" mode, "Replace engine control unit"

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28 – Glow plug system

1 Glow plug system

⇒ [“1.1 Checking glow plug system”, page 67](#)

⇒ [“1.2 Exploded view - glow plugs, Hall sender, engine speed sender”, page 67](#)

⇒ [“1.3 Removing and installing glow plugs”, page 68](#)

⇒ [“1.5 Removing and installing engine speed sender G28 ”, page 71](#)

⇒ [“1.4 Removing and installing Hall sender G40 ”, page 70](#)

1.1 Checking glow plug system

Automatic glow period control unit - J179- is located in relay and fuse holder in electronics box in plenum chamber.

3 - Automatic glow period control unit - J179-

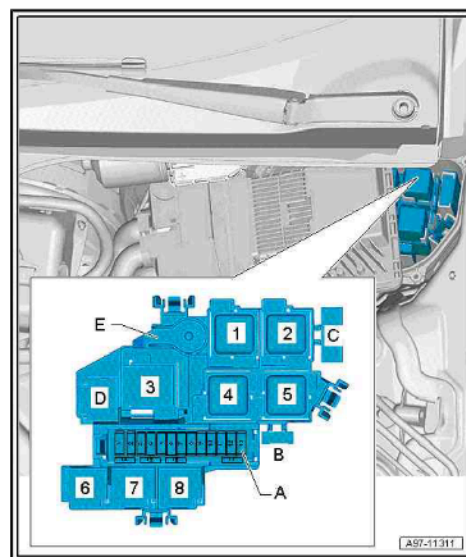
The glow plug system is activated via the automatic glow period control unit - J179- . The automatic glow period control unit - J179- is capable of self-diagnosis.

A fault is stored in the engine control unit if a fault occurs in the glow plug system.

The procedure for checking the glow plug system is described in the “Guided Fault Finding”.

For faster starting, the vehicle is equipped with electronically controlled glow plugs and a separate glow period control unit.

Each glow plug is activated and diagnosed separately.



1.2 Exploded view - glow plugs, Hall sender, engine speed sender

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1 - Hall sender - G40-

- ☐ Removing and installing
⇒ [page 70](#)

2 - Bolt

- ☐ 9 Nm

3 - Glow plug

- ☐ Glow plug 1 - Q10- ,
glow plug 2 - Q11- , glow
plug 3 - Q12- , glow
plug 4 - Q13-

- ☐ Removing and installing
⇒ [page 68](#)

- ☐ 17 Nm

4 - Electrical connector

- ☐ For glow plug

5 - Bolt

- ☐ 4.5 Nm

6 - Engine speed sender - G28-

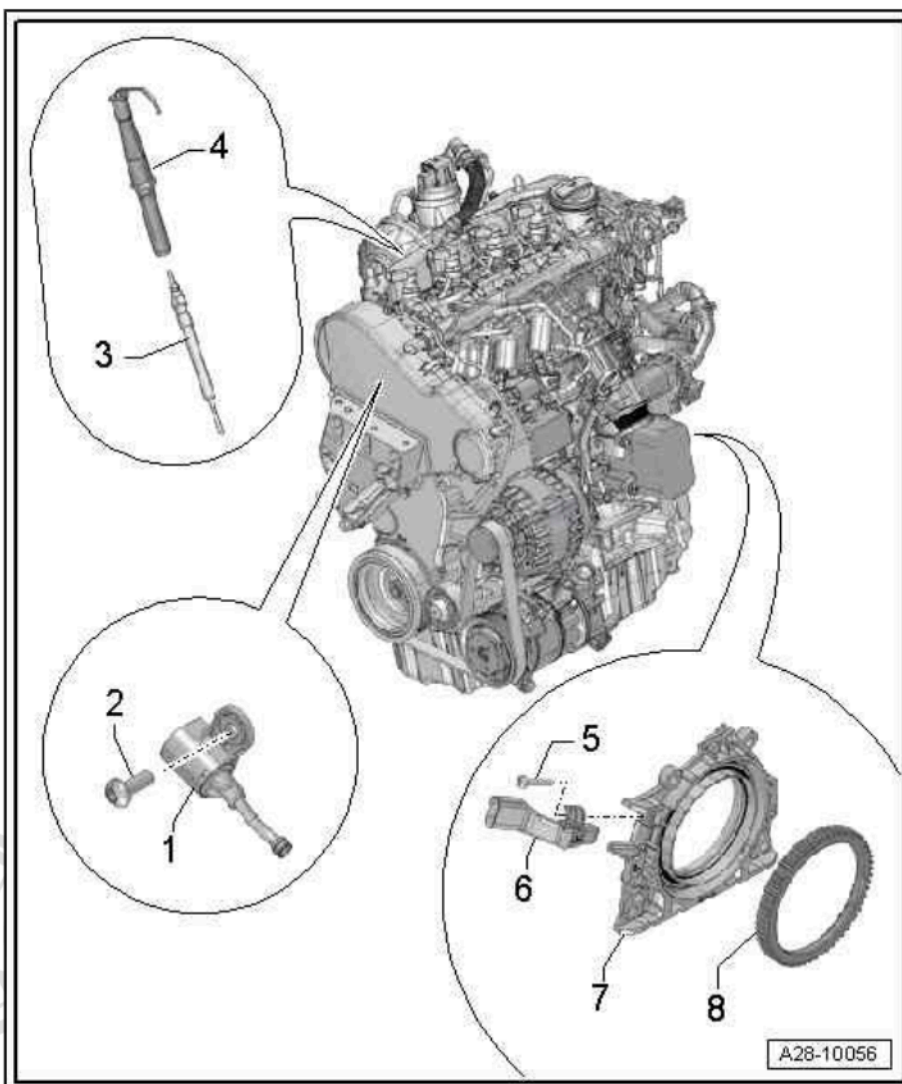
- ☐ Removing and installing
⇒ [page 71](#)

7 - Sealing flange (gearbox end)

- ☐ With oil seal
- ☐ Renewing ⇒ Rep. gr. 13

8 - Sender wheel

- ☐ For engine speed sender - G28-
- ☐ Removing and installing
⇒ Rep. gr. 13

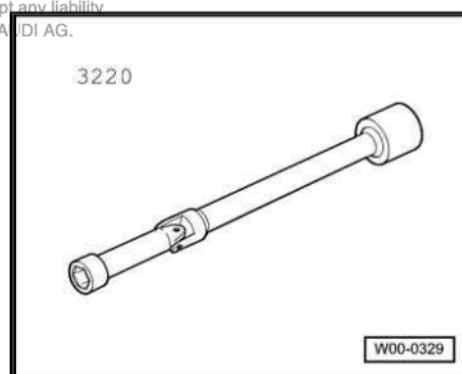


1.3 Removing and installing glow plugs

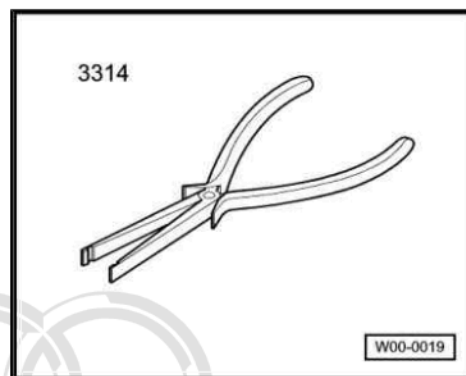
Special tools and workshop equipment required

- ◆ U/J extension and socket, 10 mm - 3220

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◆ Pliers - 3314-



Removing

- Switch off ignition.
- Pull off engine cover panel ➔ [page 16](#) .
- Clean glow plug openings in cylinder head; make sure no dirt gets into cylinder.



Note

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- ◆ **Cleaning procedure:**
- ◆ *Use a vacuum cleaner to remove coarse dirt.*
- ◆ *Spray brake cleaner or suitable cleaning agent into glow plug openings, let it work in briefly, and blow out with compressed air.*
- ◆ *Then clean the glow plug openings using a cloth moistened with oil.*
- Release retaining clips at wiring harness and detach electrical connectors from glow plugs.
- Apply groove -arrow A- of pliers - 3314- to collar of support sleeve -arrow B- and pull glow plug connectors off glow plugs.



Caution

Make sure that no wire connection is damaged when unplugging the glow plug connectors; otherwise the entire wiring harness must be renewed. When unplugging the glow plug connectors, do not compress the pliers - 3314- with too much force so that the support sleeve is not damaged.

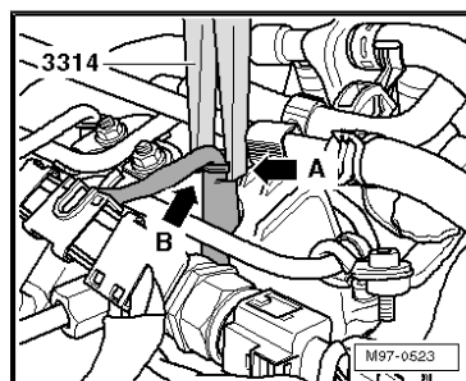
- To slacken glow plugs use special tool U/J extension and socket, 10 mm - 3220- .

Installing

Installation is carried out in the reverse order; note the following:

Tightening torques

- ◆ ➔ ["1.2 Exploded view - glow plugs, Hall sender, engine speed sender", page 67](#)

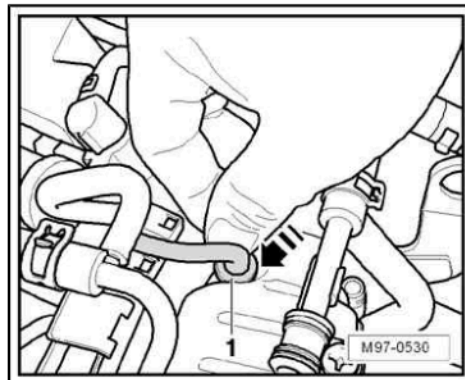


- Fit glow plug connectors -1- back onto glow plugs -arrow-.



Note

Check that glow plug connectors are securely seated.

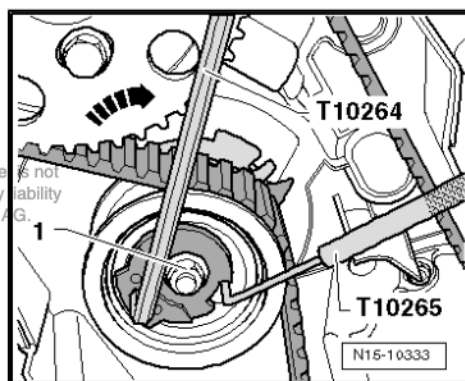


1.4 Removing and installing Hall sender - G40-

Removing

- Detach toothed belt from idler roller and high-pressure pump
⇒ Rep. gr. 15 ; Removing and installing toothed belt .

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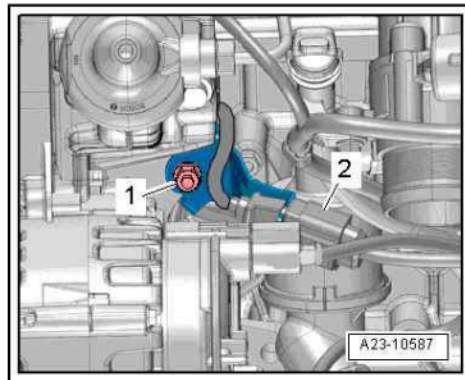


- Detach electrical connector -2- from bracket and unplug.

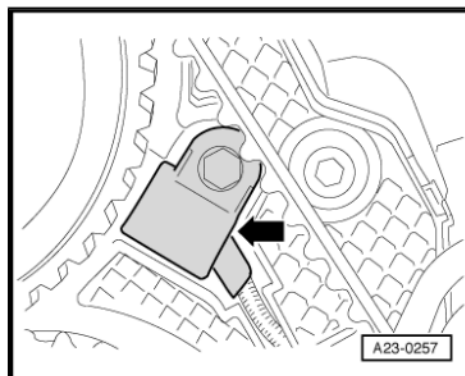


Note

Disregard -item 1-.



- Unbolt Hall sender - G40- -arrow-.



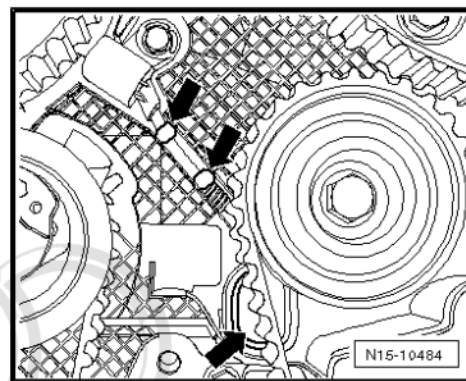
- Using a screwdriver, remove projections and take out cover for repair opening -arrows-.
- Take Hall sender - G40- off cylinder head and guide its connector through repair opening in toothed belt cover.

Installing

Installation is carried out in the reverse order; note the following:

Tightening torques

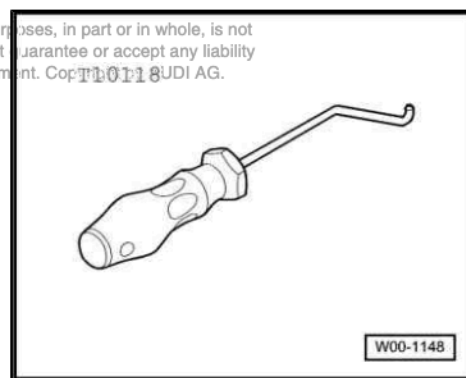
- ◆ ⇒ ["1.2 Exploded view - glow plugs, Hall sender, engine speed sender", page 67](#)
- Seal repair opening in toothed belt cover with rubber plug; for rubber plug refer to ⇒ Electronic parts catalogue .
- Fit toothed belt and adjust valve timing ⇒ Rep. gr. 15 .



1.5 Removing and installing engine speed sender - G28-

Special tools and workshop equipment required

- ◆ Assembly tool - T10118- Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright AUDI AG.



Removing

- Remove pump for exhaust gas recirculation cooler - V400- ⇒ Rep. gr. 19 .
- Unplug electrical connector -1- at engine speed sender - G28- using assembly tool - T10118- .
- Move wiring clear.
- Remove bolt from engine speed sender - G28- .

Installing

Installation is carried out in the reverse order; note the following:

- Install pump for exhaust gas recirculation cooler - V400- ⇒ Rep. gr. 19 .

Tightening torques

- ◆ ⇒ ["1.2 Exploded view - glow plugs, Hall sender, engine speed sender", page 67](#)

